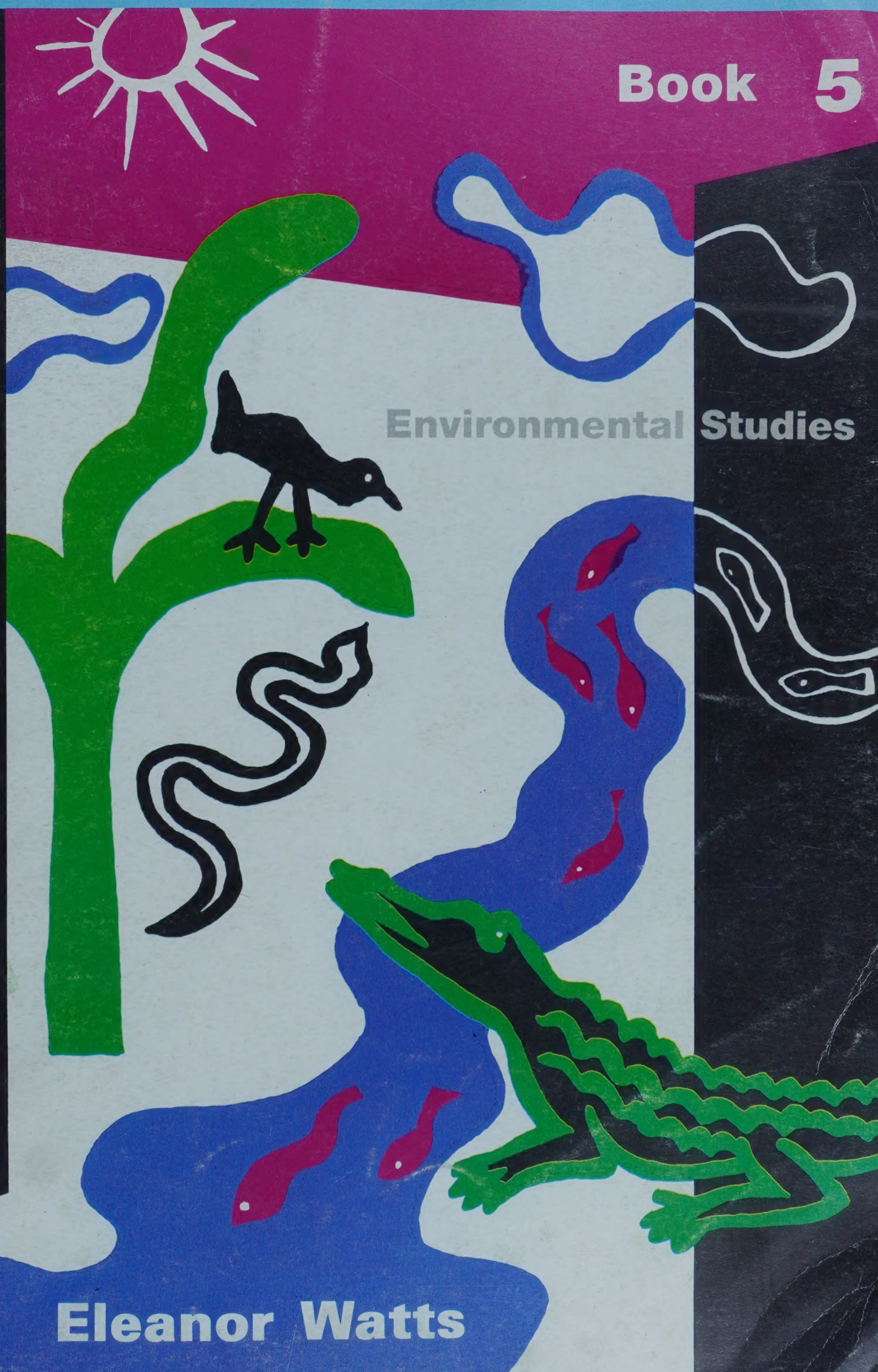
OPEN SESAME

Book 5

Environmental Studies



Eleanor Watts

SKH-1550

To the Teacher

This is a series for teachers who want their pupils to experience science rather than rote learn facts.

Many teachers are put off by activity-based teaching. They fear that their classes will become unmanageable and that the children will not pass their exams at the end of the year. This need not be so. If you prepare your materials before the lesson, the children will soon learn how to do simple experiments without any difficulty. If they have thought about and understood each concept, they will do better in their exams too.

They will enjoy science—because doing experiments is fun. More importantly, they will learn how to think for themselves. The great scientists did not become famous for knowing a lot. They became famous because they thought independently—often when everyone else thought they were wrong.

Yes, it's round. So perhaps it will sink.
No, I think it will sink because it's heavy.
I think the tomato will float.
But rubber balls float and they're round.

Encourage pupils to think for themselves.

How these books are organised

There are fewer units in these books than there are in most science textbooks. However, the units tend to be longer than usual. This is because we would like the children to look at each subject in depth and do plenty of practical work.

Each unit is divided into a number of lessons. The lessons generally have three parts:

1. Text *2. Activity* *3. Written work*

Each unit ends with a set of revision exercises.

Preparation

When you finish one lesson, look at the box at the begining of the teacher's notes for the next lesson. This lists the materials you will need. It is best to look at this box with the children. They can help collect the materials if you give them enough warning. Nearly all necessary materials are available in an ordinary home, but you cannot do the practical work without them.

Always try out experiments yourself before you do them with a class as they may not work out as you expect. Don't worry if you haven't got the exact materials; use things which you can get easily, so long as they will work for the experiment.

Collect a set of useful materials and keep them handy for your science lessons. You will sometimes need:

scissors
string
sellotape
gum (boiled rice is a cheap gum)
empty pickle or jam jars
old postcards
clay or plasticine
cotton wool
old tins or boxes
candles
matches/match boxes
cotton reels
water
sand
glasses
bucket
flower pots
earth
a torch
nails
thread

Prepare your materials before the lesson.

Contd...
(See back wrapper)

Open Sesame

Environmental Studies

Book 5

(Science)

ELEANOR WATTS

Orient Longman

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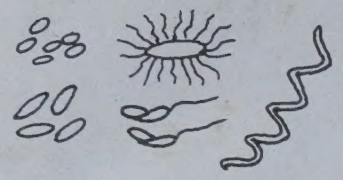
LIVING THINGS

breathe, take in food, grow, have young ones, die.

BACTERIA AND VIRUSES



are very,very small living things which you can only see with a microscope.

PLANTS

are fixed to one place,usually by roots—make their own food by photosynthesis.

INSECTS

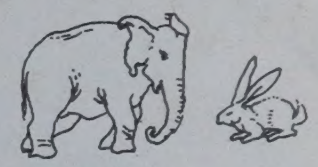
have bodies which are hard and divided into three parts — have six legs.

e.g. . . . . .

ANIMALS

have to find their own food which may be either plants or other animals — this is why they have to move about.

MAMMALS



have fur or hair, have babies (don't lay eggs) and feed the babies on milk.

eg. . . . . .

BIRDS

have light bones and feathers so most birds can fly—lay eggs.

e.g. . . . . .

FISHES

live in water, have fins to help them swim—breathe through gills

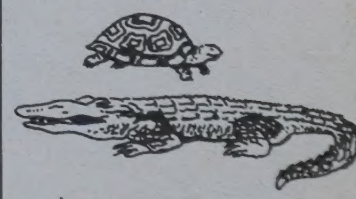
e.g. . . . . .

AMPHIBIANS

live in water and on land — lay eggs in water

e.g. . . . . .

REPTILES



have waterproof, scaly skins — lay eggs on land.

e.g. . . . . .

HERBS

have soft stems and usually live for less than a year

SHRUBS

have woody stems but are smaller than trees and do not live as long

e.g. . . . . .

TREES

have thick woody trunks, grow tall and live for many years.

e.g . . . . . .

mango	bee	eagle	snake	goldfish
wheat	frog	rabbit		hibiscus

UNIT 1

The variety of living things

Key words

adult : full-grown:*e.g .an adult man may grow a beard and have a deep voice;a puppy becomes a full-grown dog*
reproduction : the way living things have young ones or how they reproduce themselves
respiration : the way living things take in oxygen and give out carbon dioxide

A. The differences between living things

Welcome to a new year of science! First think back to what you have learnt already about living things. What do all living things have in common? What are some of the differences between living things? Talk about it in class. Then look at the chart on the opposite page.

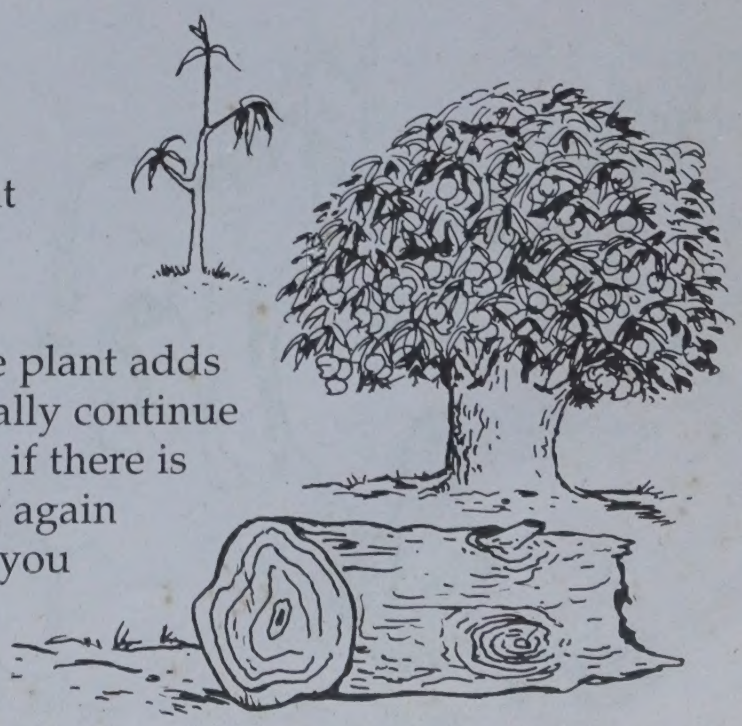
The examples in the chart are missing. Copy the chart into your exercise books and fill in at least one example for each one. The words in the boxes may help you, but you can use other examples if you like.

You have already learnt some of the important characteristics of living things. We will now discuss some of these characteristics in greater detail.

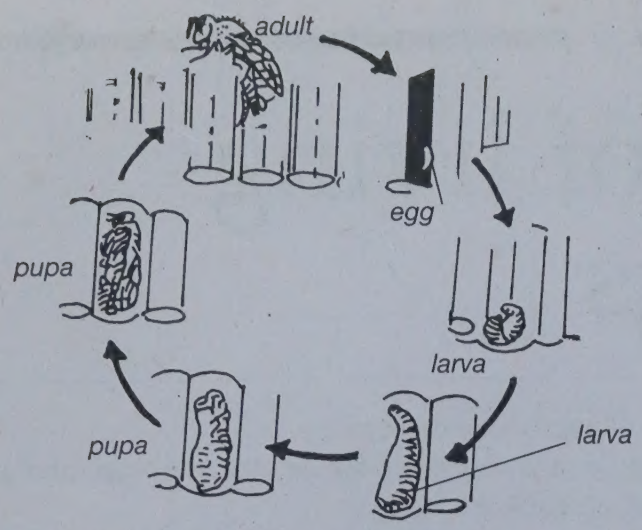
B. Growth

All living things grow, but they grow in different ways.

Plants usually grow from a seed. First there may be two leaves, then four, then gradually the plant adds more and more branches and leaves. Plants usually continue to grow until they die. Many trees stop growing if there is not enough sun or water and they start growing again when there is plenty of sun and rain. Next time you see a tree trunk that has been cut down, examine it carefully. You will find that there are rings inside the trunk of a tree. Each ring shows one season's growth.



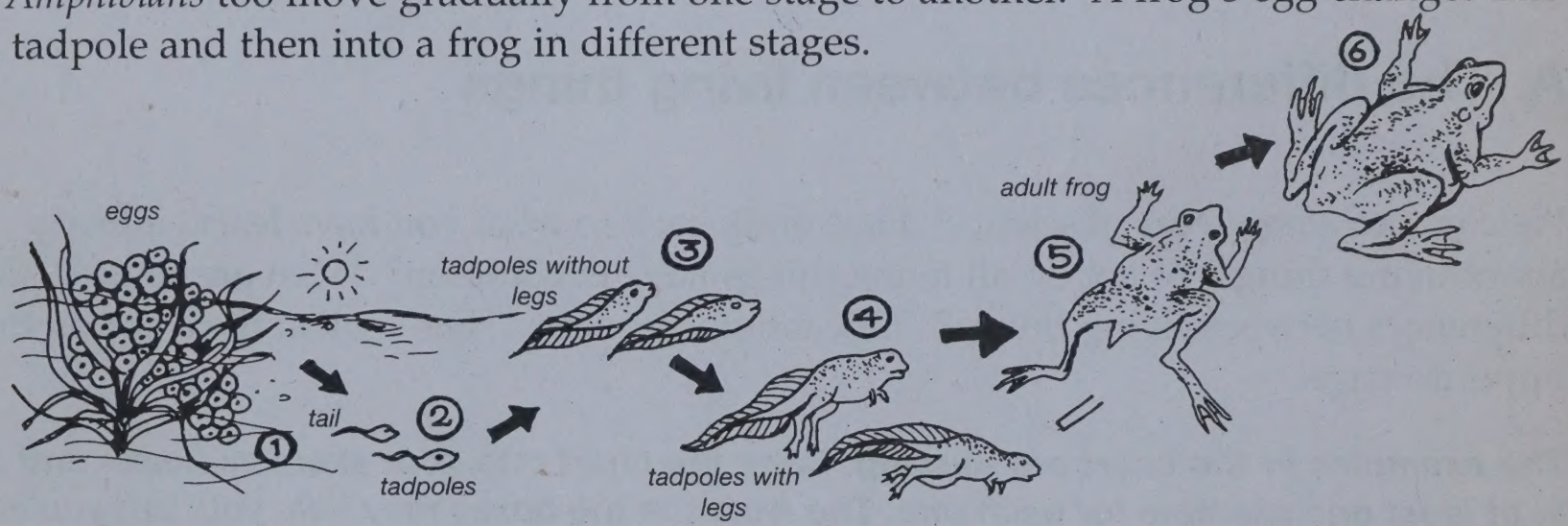
Plants continue to grow for many years



Four stages in the life of a bee

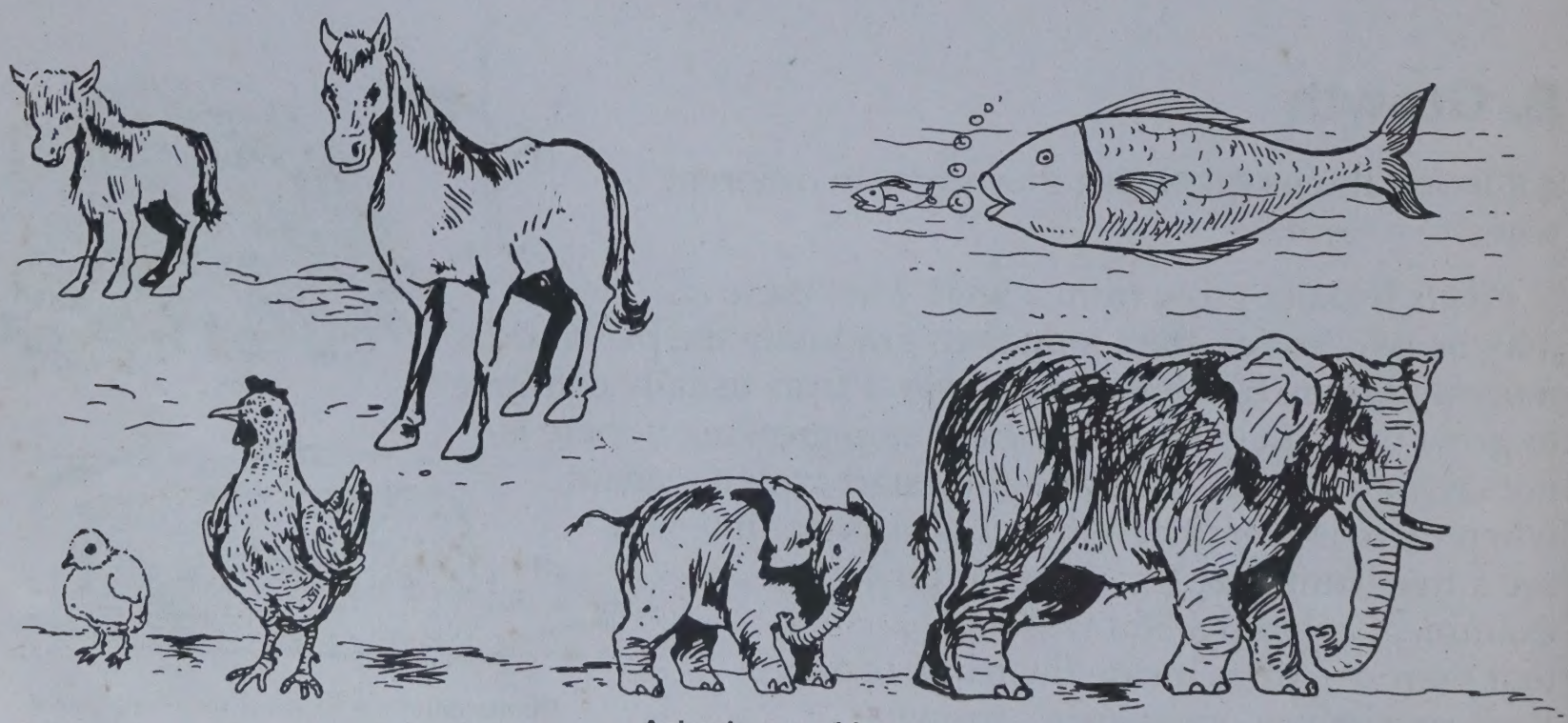
Insects usually grow in stages. At each stage, an insect may look completely different. For example, a bee starts off as an egg. Then it develops into a *larva* which doesn't look anything like a *full grown* bee. Next it makes a hard shell around itself and becomes a *pupa*. Finally, the pupa breaks open and a full-grown or adult bee comes out.

Amphibians too move gradually from one stage to another. A frog's egg changes into a tadpole and then into a frog in different stages.



Stages in the life of a frog

Most *mammals, birds, fishes and reptiles* get bigger after they are born, but they don't change much. When they become adults, they stop growing.



Animals grow bigger

Copy this table and put the living things in the box into the right column. Add one more living thing of your own to each column.

beetle monkey fly jasmine snake shark rice owl mango

Different ways of growing

Adds more and more parts until it dies	***Grows in four different stages***	***Grows until it is an adult and then stops***

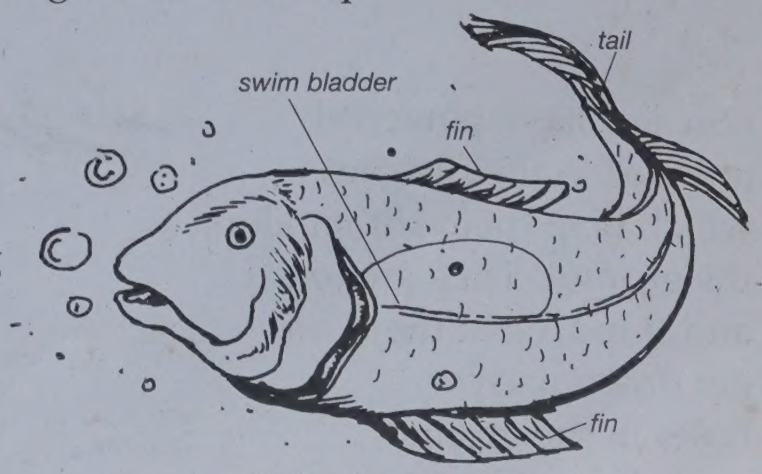
For the teacher :
This year keep a record of the growth of your pupils. Maintain a record as shown in the last few pages of this book.

C. Movement

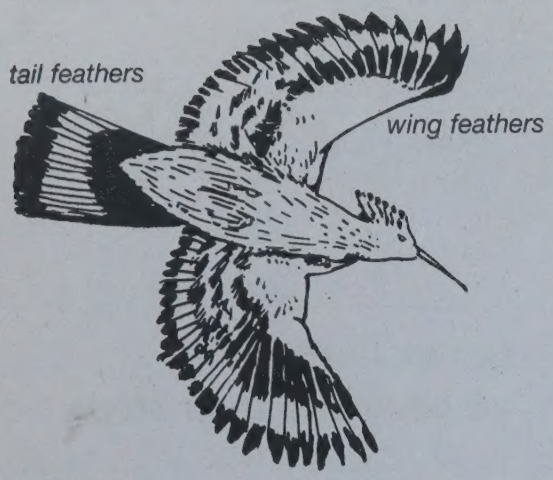
Most plants have roots in one place and cannot move. This is because they make their own food. (Remember what you learnt about photosynthesis last year.) Animals cannot make their own food so they have to move around to find it. Different creatures have slowly developed different ways of moving. Each creature has also developed a different kind of body to help it to move and find its food easily. Some animals need to move fast so that they can get away from other animals which want to eat them ! So they have developed the type of legs, feet and shape that help them to move fast.
Here are a few examples :

Plants are fixed to the ground by roots

Fishes have powerful tails to push them through water. The fins help them to steer where they want to go. Fishes also have a bag inside their bodies called a *swim bladder.* This fills with air and helps the fish to go up and down.



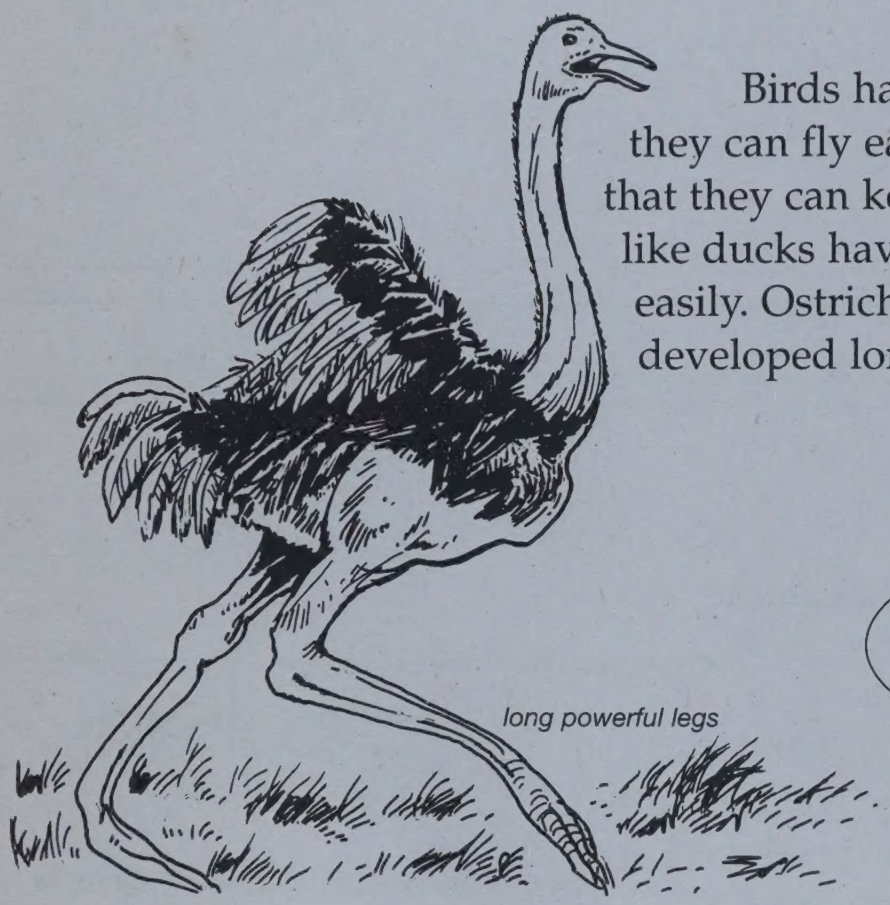
Fishes live in water.



A hoopoe

A duck

Birds have light bones and feathers so that they can fly easily. Their wings cover a large area so that they can keep the bird up in the air. Water birds like ducks have webbed feet so that they can swim easily. Ostriches are too heavy to fly so they have developed long, powerful legs for running.

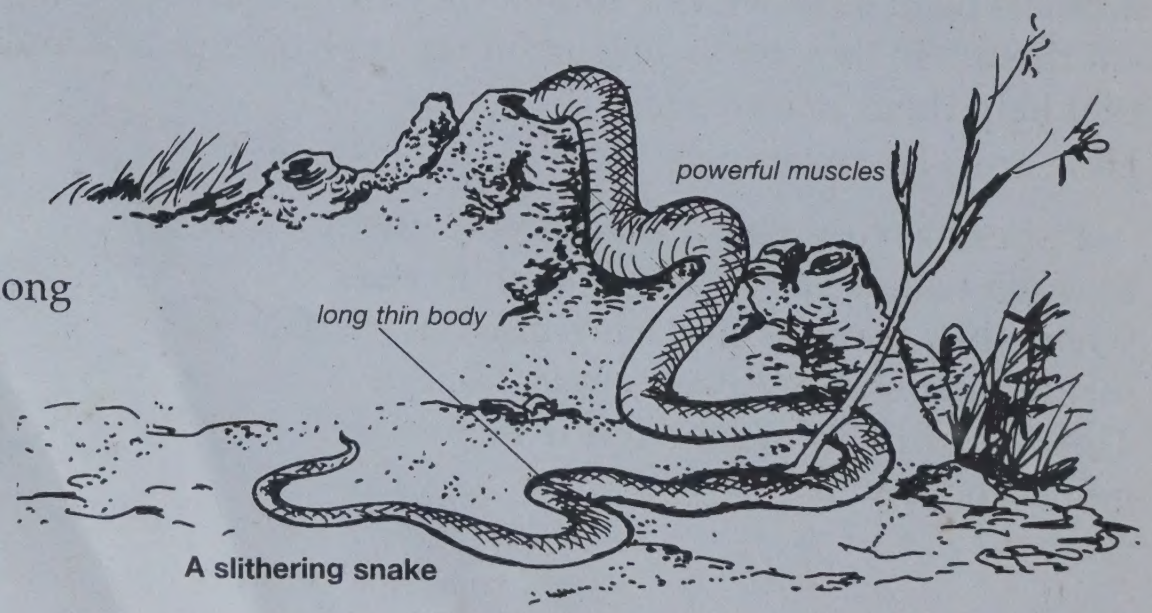


An ostrich

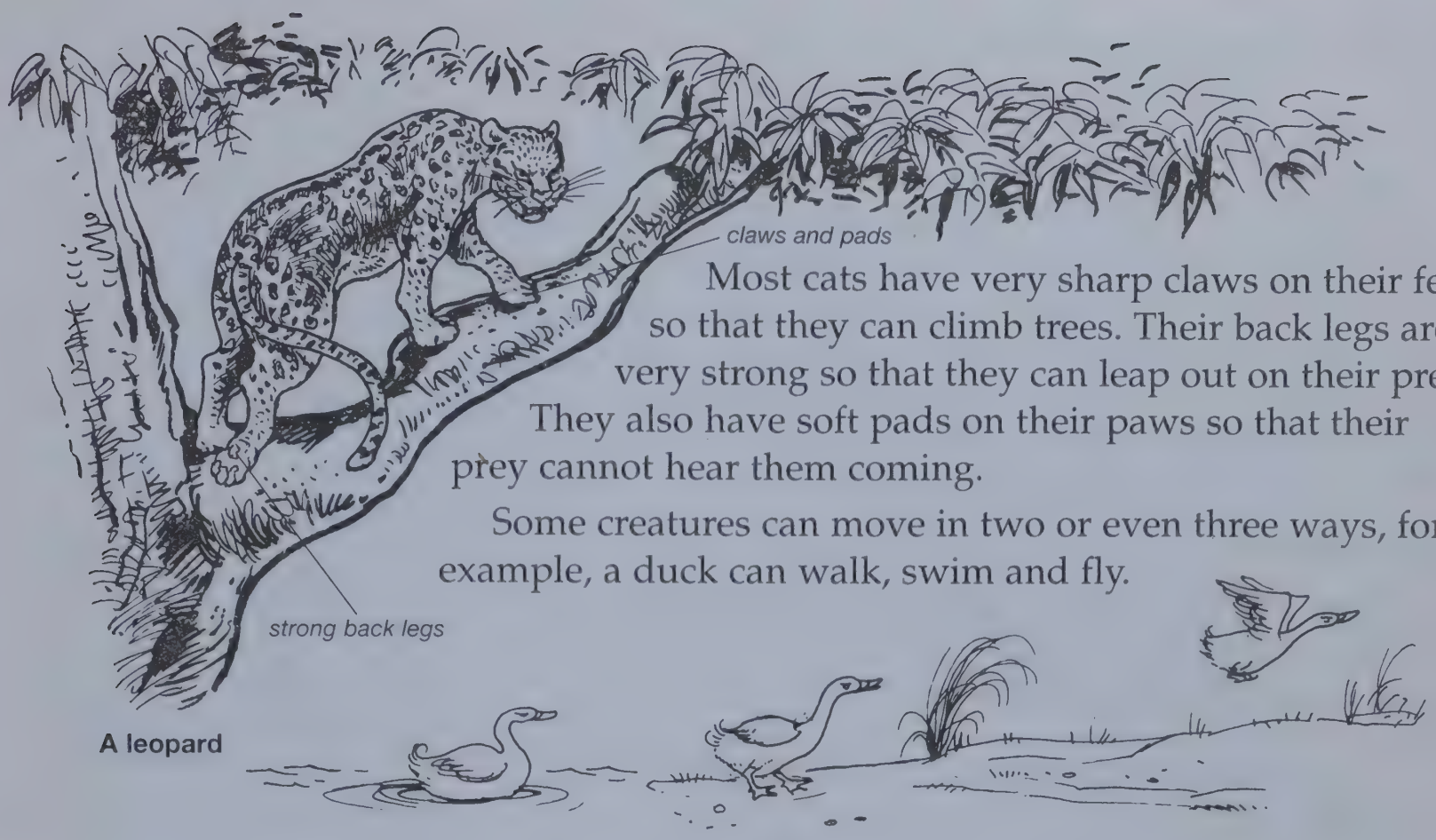
Did you know ?

An ostrich can run faster than a tiger !

Snakes have powerful muscles in their bodies which help them slither along the ground. They are long and thin so that they can get down narrow holes in the ground.



A slithering snake



A leopard

Most cats have very sharp claws on their feet so that they can climb trees. Their back legs are very strong so that they can leap out on their prey. They also have soft pads on their paws so that their prey cannot hear them coming.

Some creatures can move in two or even three ways, for example, a duck can walk, swim and fly.

Copy the Venn diagram into your exercise book and complete it with the creatures in the box below. Note that if a creature does not walk, swim or fly (e.g. a cobra) put it outside all three rings.

dog	duck	shark	ant	bee	bat
eagle	jelly-fish	earthworm	tortoise	cobra	elephant

The names of six creatures have been entered for you. You may disagree with your friends about where to place some. For example, you might decide that an owl flies or that an owl walks ***and*** flies. Whatever you decide, make sure that you can give a reason for your choice if your teacher asks you. Put some other creatures into the Venn diagram.

D Response to stimuli

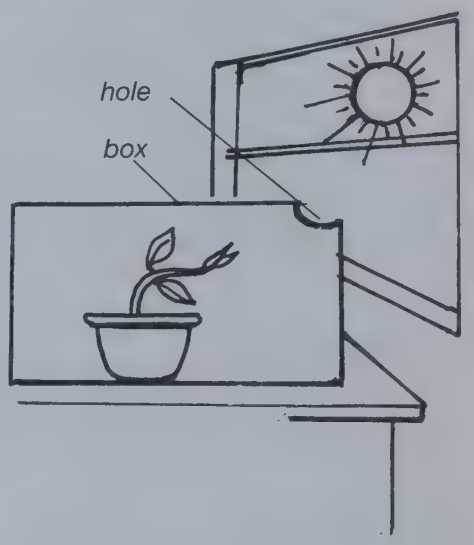
You will need :

* a green plant in a pot,
* a box into which you can fit the plant ; cut a hole at least 10 cm by 10 cm at the top of one side of the box.

All living things respond to *stimuli*. Stimuli are changes in light, sound, smell, taste, touch or temperature. Plants do not have as many senses as most animals do, but they respond to light. Sunflowers turn their heads towards the sun. Some flowers close up when the sun goes down at night. A few plants like darkness and grow towards the shade.

AN EXPERIMENT

Put a green plant in a closed box. Cut a hole at the top of one side. Water the plant every day. Check to see whether the plant is growing towards the light.

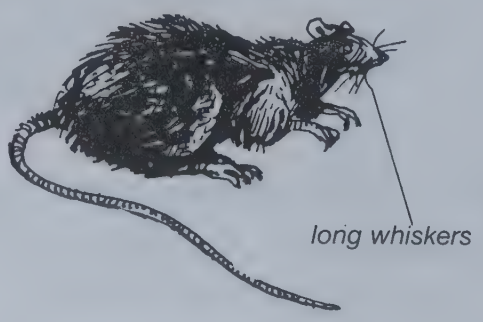


A touch-me-not closes up when touched.

Some plants respond to touch. The touch-me-not responds to touch and closes up if you touch it. It does this to stop goats and cattle from eating it.

Animals respond to different stimuli in different ways, but they do not all respond to the same things. Bats, for example, have very good ears but poor eyesight. They can catch their prey at night because they respond so well to sound although they cannot see well. Mice have long whiskers which can feel *vibrations* (shaking caused by movement). So they know when an enemy approaches. Dogs have an excellent sense of smell.

A bat



A mouse

A dragonfly

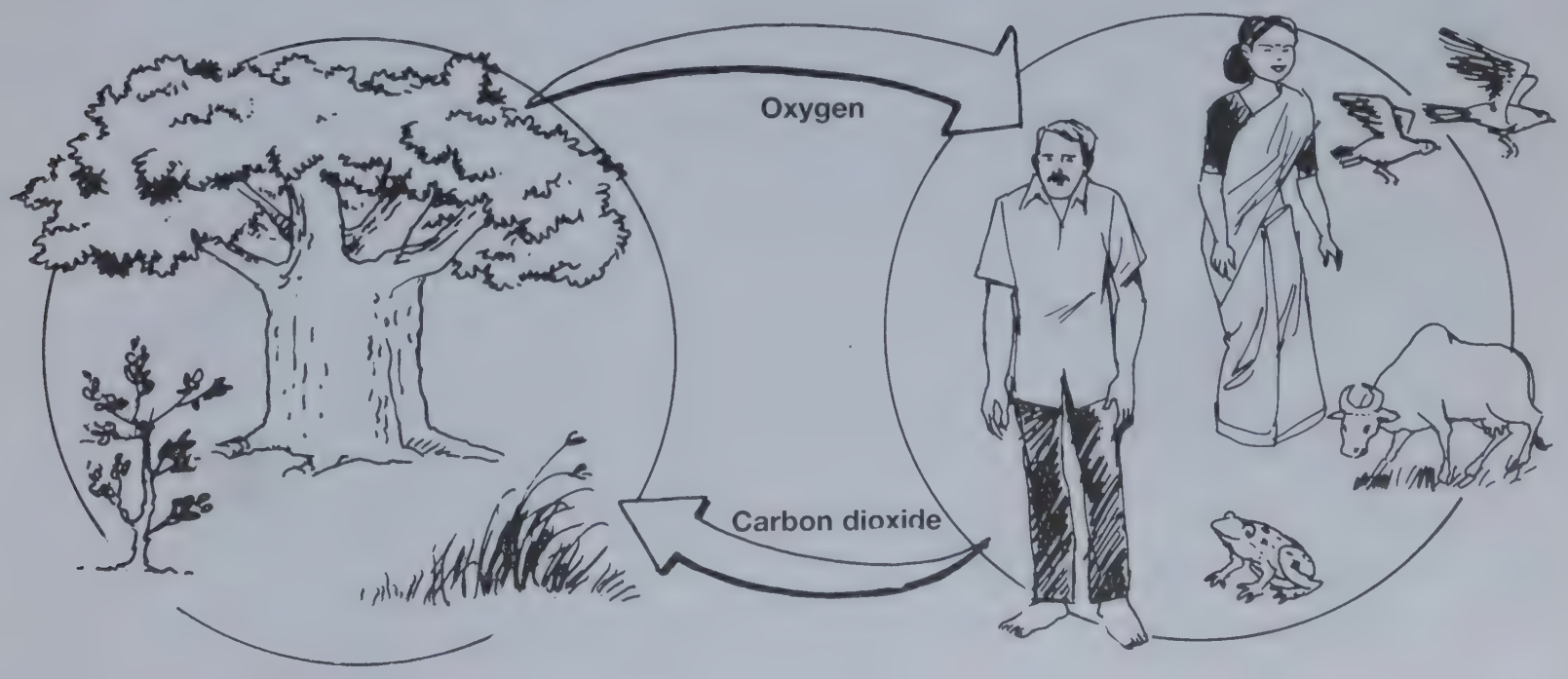
How do you respond to the following stimuli? Complete the sentences using the ideas in the box — or use your own ideas. An ending to the first one is suggested.

you get out of its way.	you spit it out.	you jump.
you wake up.	you shut your eyes.	you fall asleep.

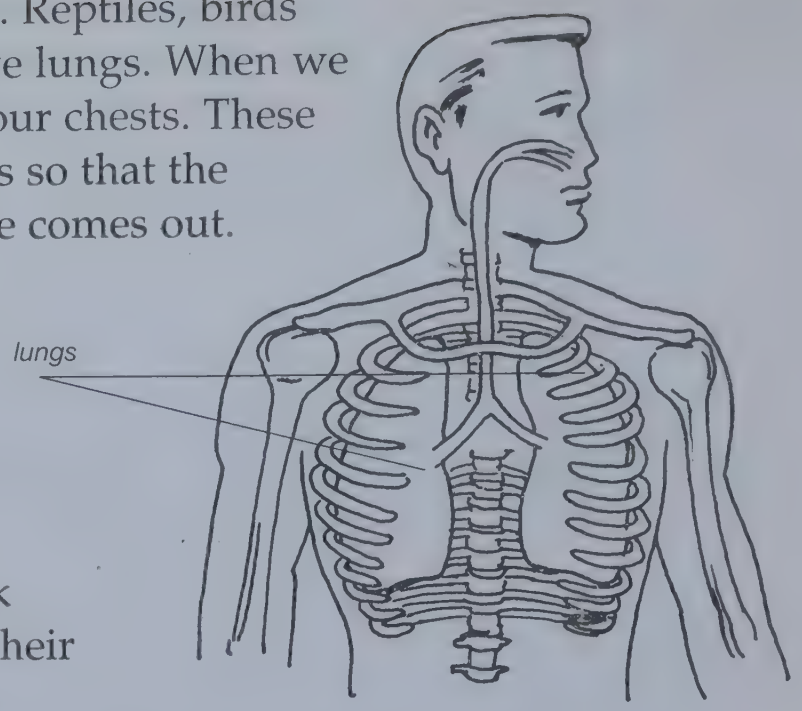
1. If you touch a hot cooking pan, *you take your hand away fast.*
2. If you are sleepy and drink a lot of coffee, ...
3. If you drink salty water by mistake, ...
4. If you hear a loud bang, ...
5. If you lie under a fan on a hot day, ...
6. If you see a car speeding towards you, ...
7. If someone suddenly shines a torch in your face on a dark night, ...

E. Respiration

In Class 4, you learned about *photosynthesis* in green plants. Plants take in water and minerals from the soil. They take in sunlight and carbon dioxide through their leaves. They use their green colouring (chlorophyll), to make their own food. They give out water vapour and oxygen. If there were no plants, there would be no life on earth because all living things need oxygen. Even plants take in oxygen, though they give out more than they take in. Living things breathe in oxygen and breathe out carbon dioxide. This is called *respiration*.

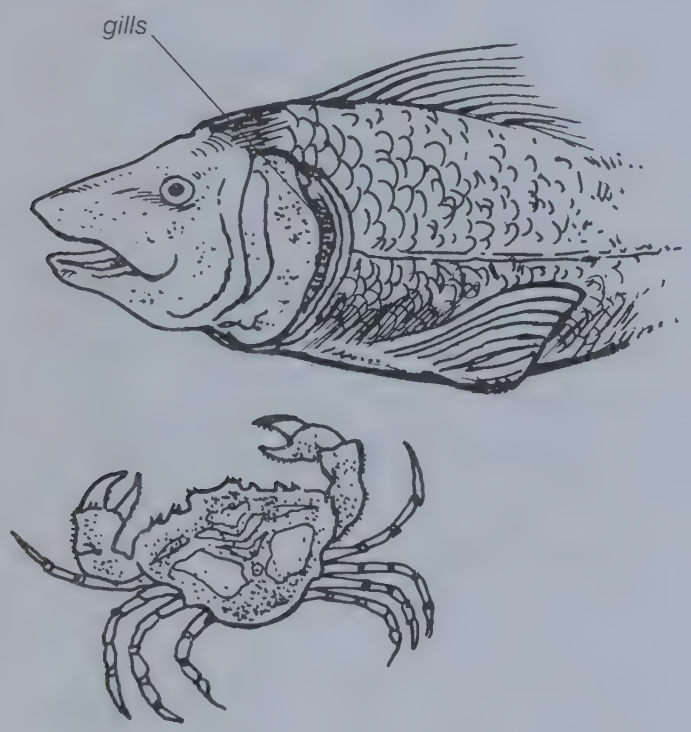


Different creatures respire in different ways. Reptiles, birds and mammals (including human beings) have lungs. When we breathe in, the air goes into two bags inside our chests. These are called *lungs*. They are full of blood vessels so that the oxygen can go into the blood. Carbon dioxide comes out.



Human beings take in oxygen through their lungs

Frogs have lungs too, but these do not work very well. They can take in oxygen through their skin and mouths. Insects do not have lungs. They take in air through tiny holes in their bodies which lead to lots of air-filled tubes inside.



Fish, crabs and water snails do not have lungs because they live under water where there is no air but there is oxygen dissolved in the water. They take this oxygen from the water through their *gills*. Fish take in water through their mouths and force it out through the gills. The oxygen goes from the water into their blood.

Make eight true sentences about living things and how they respire.

1. In photosynthesis, green plants take in	
2. They give out	its lungs.
3. In respiration, animals take in	tiny holes in its body.
4. They give out	oxygen.
5. A shark takes in oxygen through	its skin.
6. A frog takes in oxygen through	carbon dioxide.
7. A dog takes in oxygen through	its gills.
8. A beetle takes in oxygen through	

Note : Look at your plant in a box. Is it growing towards the light ?

F. Reproduction

Reproduction is the way living things have young ones.

REPRODUCTION IN PLANTS

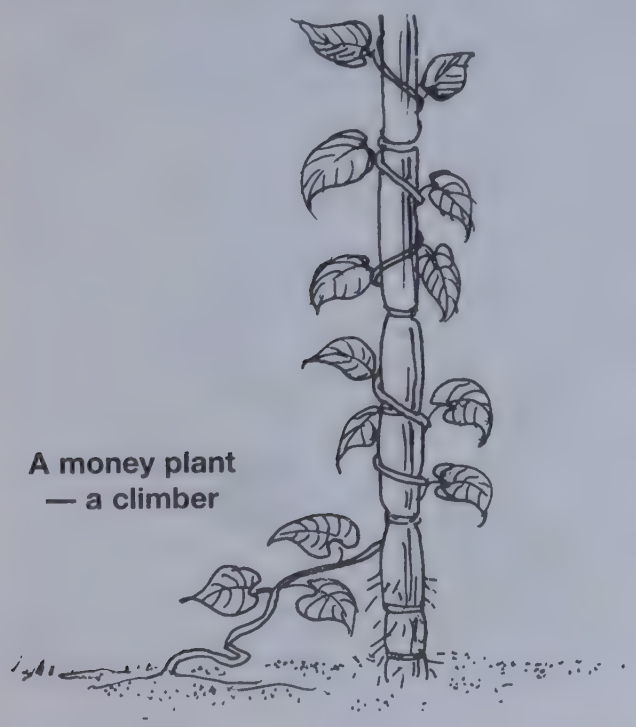
Most plants reproduce by spreading their seeds. In Class 4 you learnt about how seeds spread. Some plants grow from seeds. When the seeds fall on the ground they begin to grow and new plants form.

Most plants reproduce from seeds

Many plants do not grow from seeds. Some plants grow *runners*. They grow sideways across the soil and send roots into the soil. Pumpkin plants do this.

Runners of pumpkin plants

You can take cuttings of some plants by cutting a piece of the stem and sticking it in the earth. You can do this with sugarcane and money plants



A money plant — a climber

The bulb of an onion

You can also grow some plants, like onions, from bulbs. Small bulbs grow off the bigger ones.

Most animals reproduce in one of two ways. They lay eggs or they have babies. Fish and amphibians lay eggs in water. The mother usually does not guard her eggs. Because she does not look after them, many of them die. This is why she lays hundreds and hundreds of eggs. Even if most of them are eaten, a few hatch and develop and live to grow into big fish. But not always...

Reptiles and birds usually look after their eggs. Birds often sit on their eggs to keep them warm until they hatch. Birds feed their babies and teach them to fly.

Birds feed their young ones

A worker bee feeds a young larva

All the eggs in a bees' nest are laid by one female —the *queen bee*. She lays her eggs in wax cells which are made by the *worker* bees. The worker bees don't have any eggs of their own. When the eggs hatch into larvae, the workers feed them.

Mammals do not lay eggs. Babies develop inside the mother's body. When they are born, she feeds them with milk. She also teaches them how to get on in life — how to get food, how to keep clean, how to keep away from danger.

Cows, cats, dogs, monkeys and human beings are all mammals that give birth to their young ones.

Answer the following questions :

1. Where do amphibians lay their eggs ?
2. Do mother fish usually look after their eggs ?
3. How do mother and father birds look after their babies ?
4. Who look after the larvae of bees — their mothers or other bees ?
5. How does a mother dog look after her puppies ?
6. When we see a kitten, a puppy or a human baby, we usually think, 'Oh how sweet!' Why do you think Nature makes babies so pretty ?

Revision

I. Complete the following sentences :

1. In respiration, living things take in ..... and give out ..... .
2. In photosynthesis, green plants take in ..... and ..... and they give out ..... and ..... .
3. Mammals take oxygen into their bodies through their ..... .
4. Fish take oxygen into their bodies through their ..... .
5. When a frog's eggs develop they turn into ..... .
6. If you cut a piece of a plant's stem, put it in the ground and it starts to grow, it is called a .....

II. Answer these questions :

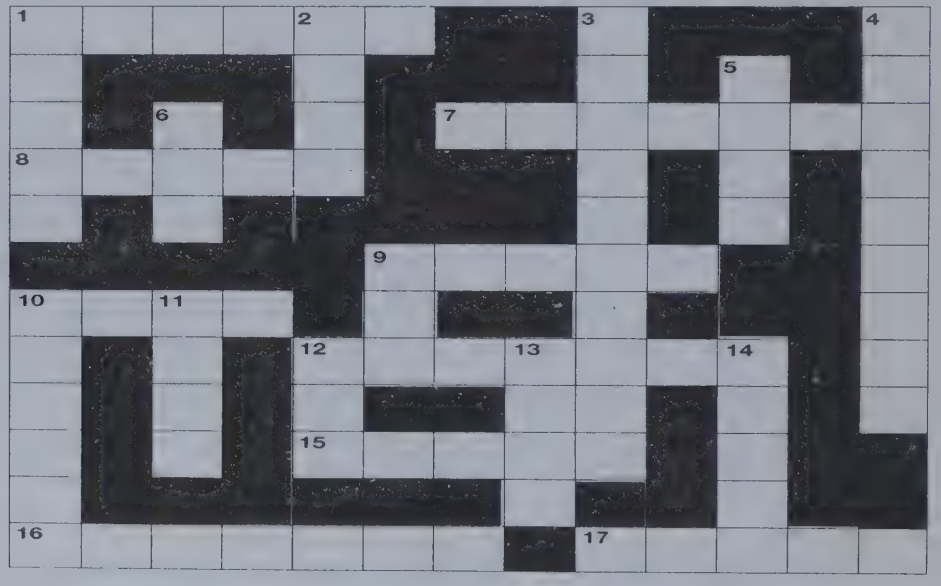
1. Name a creature which becomes a larva while it is developing.
2. Why do most animals have to move around.?
3. Why can most birds fly easily ?
4. If you put a plant by a window, does it usually grow towards the window, away from the window or grow straight upwards ? Why ?
5. How are whiskers useful to a mouse ?
6. A policeman gives his dog a thief's shoe. The dog then finds the thief's house, though it has never seen the thief. What stimulus is the dog responding to ?

Clues across

1. A..... grows sideways across the soil and grows roots into the soil.
7. A.....has a scaly skin and lays its eggs on land.
8. ..... have woody trunks and live for many years.
9. ..... are plants with soft stems that usually live for less than a year.
10. The larva of a bee grows a hard shell around itself and becomes a .....
12. ..... cannot make their own food like green plant do, so they have to move about in search of food.
15. Fishes steer themselves in water with the help of their powerful .....
16. All living things respond to .....
17. Dogs have a very good sense of .....

Clues down

1. ..... grow into the soil and absorb water for plants.
2. Bats have very good ..... .
3. ..... live in water and on land, but lay their eggs in water.
4. ..... are very large mammals with trunks.
5. ..... breathe through their gills in water.
6. Only the queen ..... lays eggs.
9. A ..... is a female cock.
10. Green ..... make their own food by photosynthesis.
11. Cats have soft ..... on their feet so that their prey cannot hear them.
12. An ..... is an insect that cannot fly.
13. A bull is a ..... cow.
14. ..... is a long reptile without legs.



Extension work·

You will need your parent's help to do this :

Find out about your own development as a baby and write about it.

1. How old were you when you first :
   a) smiled? b) turned over on one side? c) got a tooth? d) ate solid food?
   e) crawled? f) walked? g) said a word? h) said a whole sentence?
2. Think of your life now.
   a) What things can you do without your parents?
   b) In what ways do you still need your parents?

UNIT 2

Living things and their environment

Key words

adapt : to change to suit the environment, e.g., *If we go to the mountains, we adapt to the cold weather by putting on warm clothes.*
camouflage : to hide by using the same colours as the surroundings, e.g., *The beetle is camouflaged in the grass because its wings are green.*
evolve : to change over a period of time
habitat : the place where an animal or plant lives naturally e.g., *The habitat of a shark is the sea.*
species: type of animal or plant e.g., *What species is this?*
It's a krait.

For the teacher :

If you do not have a pond in your school grounds, you will need to organise a trip to a clean pond, well or stream for Exercise C. Perhaps this could be combined with a visit to a nearby park where different types of trees and flowers can be observed. Perhaps you could ask some parents to help you to accompany the children. You will need small nets. You could use cloth bags or you could make nets with old mosquito netting and wire. Collect plenty of glass jars so that you can put the creatures in bottles with some water and observe what you have caught.

A. Living things adapt to their environment

We looked earlier at the variety of life. We saw how many different kinds of animals and plants there are. In this unit, we will find out why they are so different. We will see that plants and animals *adapt* themselves to their environment. Fish have evolved a shape which is best for moving in water. Birds have *evolved* a shape which is best for flying, and so on.

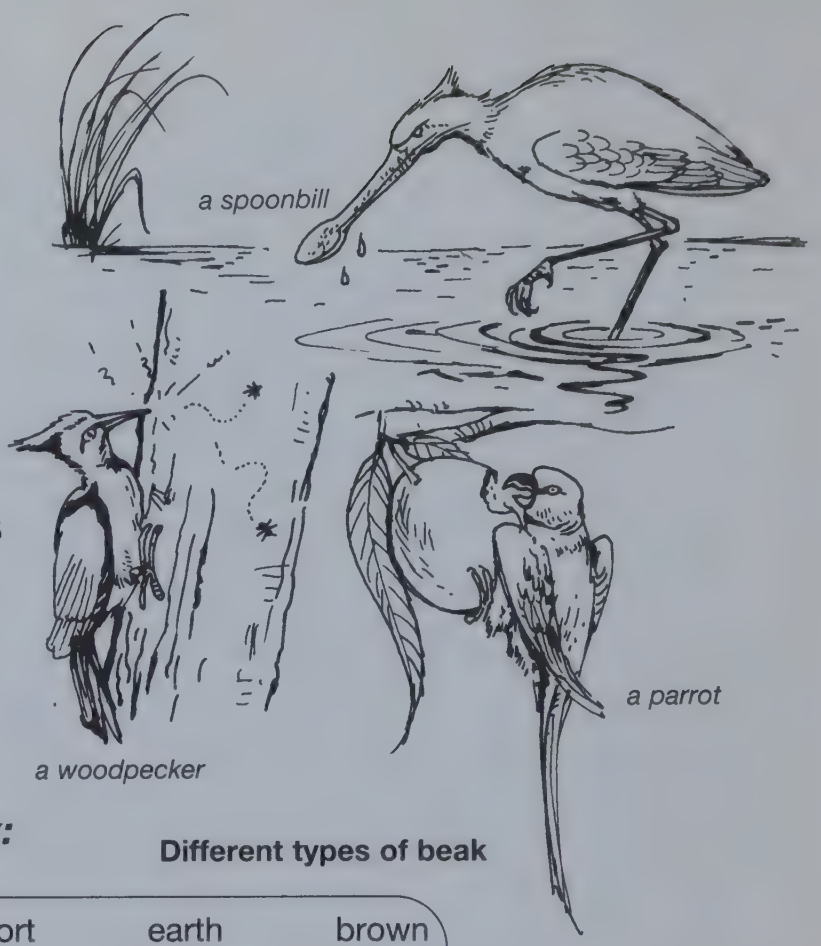
An arctic fox in winter

Different living things have different *habitats.* They live in different places. So they have changed or evolved in different ways to suit the place they are living in. An Arctic fox has a thick white coat in the winter and a brown coat in the summer. The white coat hides it from its enemies and keeps it warm in the cold winter snow. The brown coat hides it from its enemies in summer after the snow has melted because it is the same colour as the earth. An Indian fox has much less hair because the climate in India is warmer than it is in the Arctic.

A Indian fox

Different animals adapt parts of *their bodies* to suit the food they eat. A spoonbill has a spoon-shaped beak so that it can dig up worms from under the mud. A woodpecker has a long, pointed beak so that it can get insects out of the bark of trees. A parrot has a curved beak so that it can eat fruits easily.

In this unit, we will also look at the way people are harming plants and animals because by doing this they are harming their environment. Many living things are dying because people are thoughtless and take more than they really need.



Different types of beak

Fill in the blanks, using the words in the box:

mud	snow	hot	curved	short	earth	brown
pointed	white	spoon-like	habitat	fruit	bark	

1. An Arctic fox is .....in winter to hide in the .....
2. An Arctic fox is ..... in summer to hide against the .....
3. An Indian fox has ..... hair to keep it cool in ..... weather.
4. A spoonbill has a ..... beak so that it can scoop its food out of the .....
5. A woodpecker has a long, ... beak so that it can get insects out of the .....
6. A parrot has a ..... beak so that it can eat .....
7. The place where a plant or animal usually lives is called its .....

B. Life in the sea

More than two-thirds of the world is covered by sea. There are many different habitats in the sea.

Seaweeds and shell-fish usually live in shallow seas. Lots of different types of fishes live in shallow water because the sun's rays shine through it.

The oceans of the world are usually very deep and dark. This is why most sea creatures live near the surface where the light of the sun can reach them. However there are creatures which live deep down in the sea.

Angler fish

Did you know?

The angler fish carries a light to attract smaller fish. Then it eats them!

The surface of the sea is covered with tiny plants and animals called *plankton*. Plant plankton make their own food by photosynthesis just like land plants. In fact they give out over two-thirds of the oxygen in the world — more than trees do. Many fish (even enormous whales) feed on the plankton. Bigger fish eat these small fish. So all sea life needs the plankton for food and oxygen.

This picture shows different sea habitats.

Sea habitats

Fish is very good food for us because it contains a lot of protein, and not much fat. Unfortunately, nowadays people are catching too much fish and there are fewer fish in the sea. In the past, fishermen used to catch fish in nets with big holes. These nets caught big fish, but let baby fish and small fish through the holes. So the babies could grow up into big fish and the small fish were still there for the big fish to eat.

Now many fishermen are using very big nets with tiny holes. These catch everything —small fish as well as big ones.The fishermen take the big fish, but the baby fish and the small fish die. If we are not careful,many species of fish will die out.

Design a poster to teach fishermen about the dangers of using a net with small holes. Remember, a poster should have:

- a short, catchy slogan,
- neat, bold writing,
- a clear, colourful picture which illustrates the point.

C. Life in fresh water

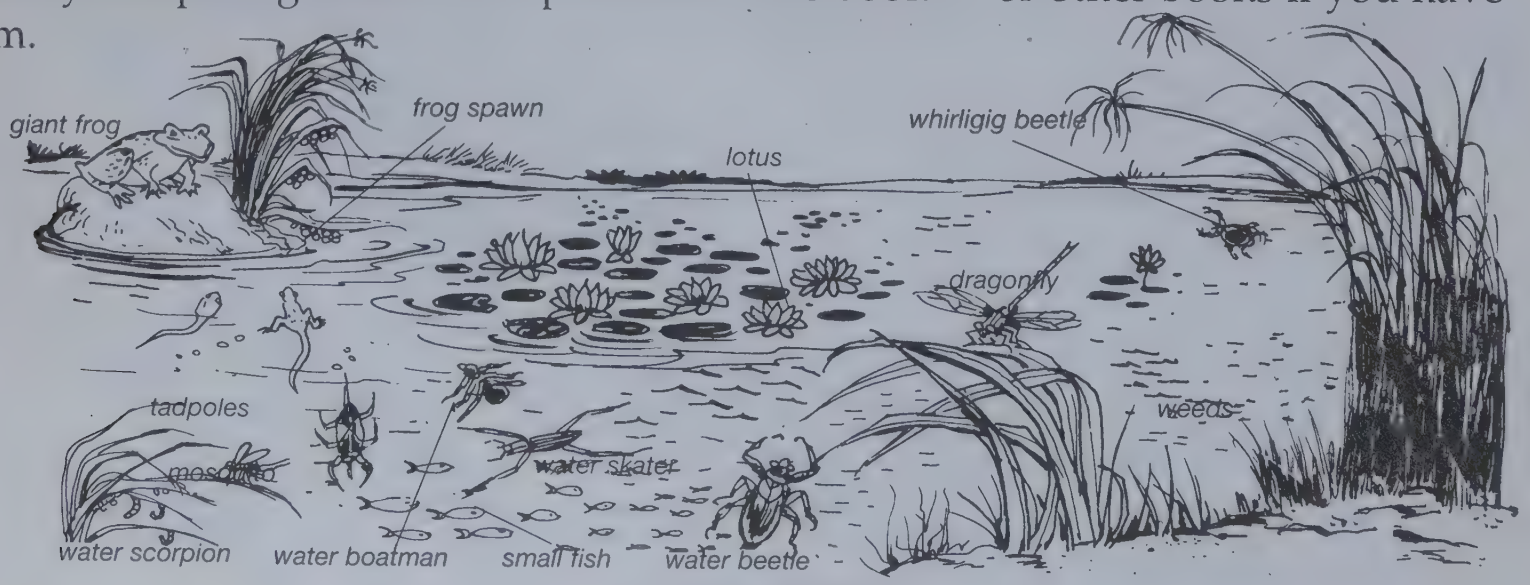
You will need:

* glass jars, fishing nets or cloth bags, old clothes, and if possible, magnifying glasses,
* if possible, books about pond life, paper, pencils and clip-boards.

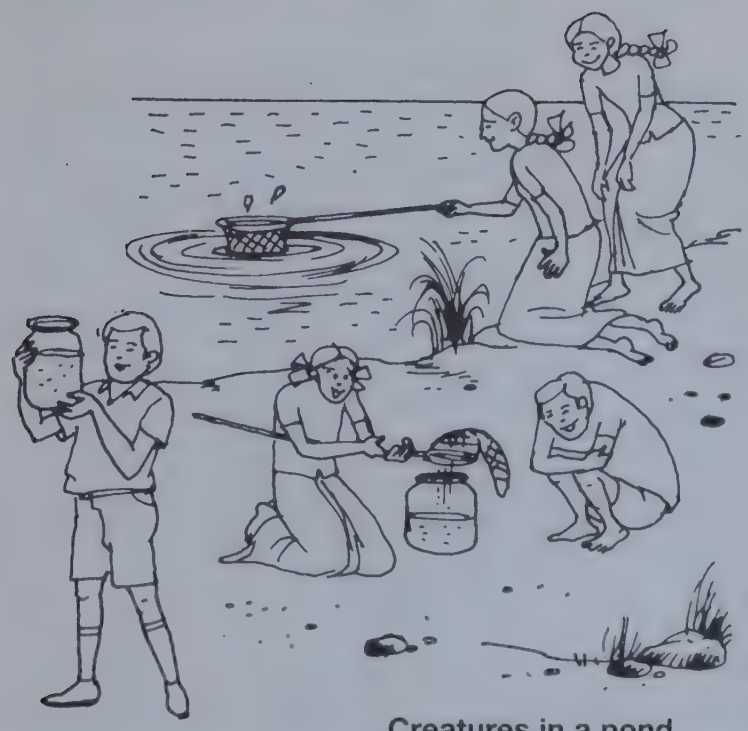
Fresh water is not salty like the sea. Most life in fresh water is found in rivers, ponds and lakes. At the top of a stream, the water usually flows fast, so animals and water plants have to hold on tightly to the bottom. Usually small fishes live in deeper and slower parts of a river. There are also snails, frogs and lots of insects here.

Mosquitoes,dragonflies and many beetles lay their eggs in water. Many birds which have adapted themselves to live near water have long legs so that they can wade about while they look for food. Most water plants, like lotuses, have long stems so that they can reach the bottom of the lake. As all creatures need water, most wild animals come to streams and lakes to drink.

When you look at a pond, you may think that there is nothing in it except water and a few fishes and frogs. This is not true. All the creatures you see in the picture below may be there, but you may need to look hard. Visit a nearby pond, well or stream. Make sure that you are wearing old clothes which can get a bit dirty. Take nets or cloth bags and drag them through the mud near the edge of the water. Carefully pick out the living things you find and put them in a glass jar of clear water. Try to identify them by comparing them to the pictures in this book — or other books if you have them.



Life in fresh water



Creatures in a pond

Water boatmen and water skaters have long legs. Because they are light and can spread their weight out, they can walk across the surface of the water. Water snails move very slowly across the bottom of the pond. If there is a little mud at the bottom of your jar, you will see their tracks. Look for mosquito larvae. If you find them near your own house, cover up the water or drain it away. These larvae will turn into mosquitoes and they will spread diseases.

Make sketches of the creatures you found and label them if possible. Make sure that you do not hurt the creatures and put them back in the water after you have finished your sketches. Wash your hands well when you get back.

Make neat drawings of the creatures you found when pond dipping. Label them if possible and write your observations about their shape, colour and the way they moved.

Here are Ranvir's observations of a snail.

My group found two small snails.

They were about the same size.
One was brown and one was white.

We put them in a saucer of wet sand.

They moved very slowly and left paths in the sand.

A snail

D. Life in the rainforest

Rainforests grow in places where the climate is hot and wet. Although they cover less than 10 per cent of the land in the world, more than half the plant and animal species on earth live there.

The biggest rainforest in the world is in the Amazon basin of Brazil. Because there is so much greenery, it produces a great part of the world's oxygen. It also gives us many different kinds of vegetables and medicines. For hundreds of years, tribal people have lived in the Amazon. They have lived on the fruits, nuts and wildlife of the rainforest, but they have not harmed the trees. Here are some of the creatures and plants which live there.

Today more than half of the world's rainforest has been cut down or burned down. In the last 30 years, people from the cities have burned the forests so that they can farm the land or build houses. There are more and more people on the earth. They all want land. Other people are cutting down the hard wood for building houses and furniture. This wood is sold to other countries.

It is important to remember that when the forests are cleared, they cannot be replanted. The soil in a tropical rainforest is thin. A few years after the trees are cleared, the rain washes the soil away. People cannot even farm the land after this.

In India there used to be big rainforests in the Western Ghats. Now most of them have been cut down because people need land and firewood. We must try to make sure that people can get money and fuel without cutting down forests. When the forests have gone, it could take hundreds of years for them to grow again.

Rainforest destroyed in the Western Ghats

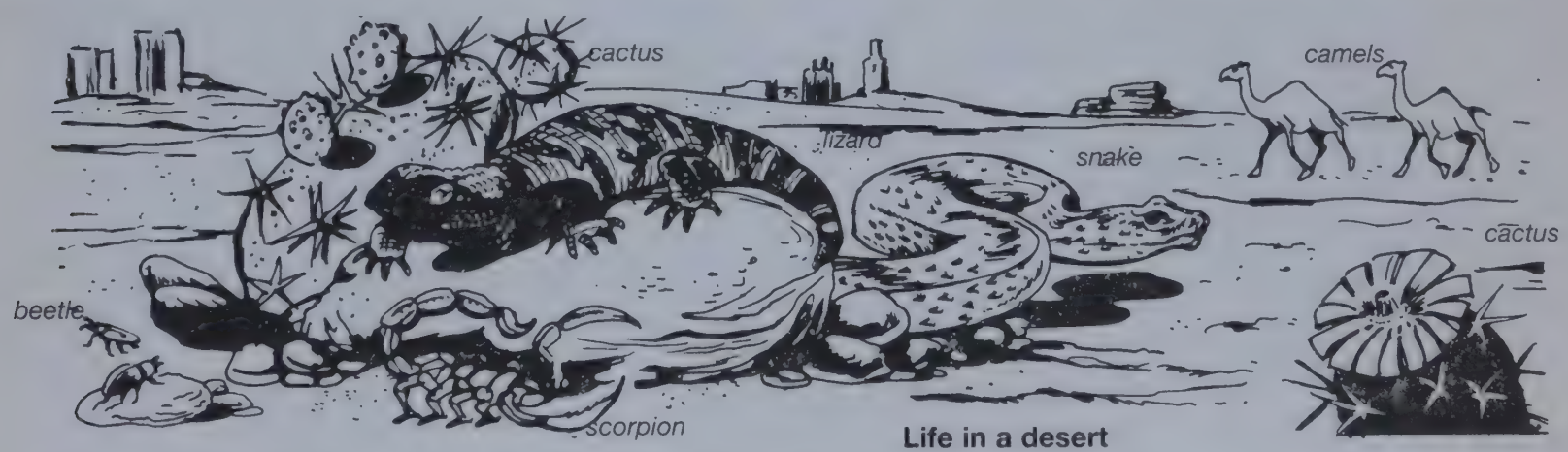
Write the true sentences in your exercise books. Change the untrue sentences so that they are correct.

1. Less than one hundredth of the world is covered by rainforest.
2. More than 50 per cent of plant and animal species live in rainforests.
3. A toucan is a kind of a butterfly.
4. Toucans, parrots and macaws are birds which live in the Amazon.
5. Rainforests produce a lot of oxygen.
6. People are destroying rainforests because they want land.
7. It is easy to replant rainforests after they have been cut down.
8. We must look after the rainforests which are still alive.

E. Life in the desert

Deserts are dry places where very little rain falls. All living things need water, so wildlife in the desert has to adapt to the dry environment.

Some deserts are very hot in the day and very cold at night. Beetles, snakes, lizards and scorpions live in hot deserts. They hide in holes in the ground during the heat of the day. They come out to feed at night. Camels are too big to hide in holes under the ground. They have thick hair which keeps off the sun. They can also go for days without eating or drinking. Their feet are wide so that they do not sink into the sand.



Life in a desert

Cacti have thin prickles instead of leaves, so they do not give out much water vapour. Their thick skins keep in water too. They have very long roots which reach down to the water under the ground. Some desert plants remain dormant (asleep). When there is a little rain, they grow and develop new plants very quickly.

Many deserts are getting bigger because there are more and more people in the world who need more space to live, more food to eat and more wood to build houses and cook food. So they cut down more and more trees at the edges of deserts. They also allow their goats and cattle to eat whatever greenery there is. This means that there are no roots to hold down the good soil. The soil is washed away when it rains so that nothing more can grow. When there are no plants, there is less water vapour in the air. So the desert gets bigger.

Not all deserts are hot. Some are very cold. The Arctic and Antarctic are both icy deserts. In cold deserts most animals have thick layers of fat and fur to keep them warm. Polar bears sleep through the cold winters in holes in the ice. Like camels, they have wide feet to stop them sinking into the snow, not the sand! They have white coats. These coats camouflage them in the snow, like the coats of Arctic foxes. This makes it difficult for their prey and their enemies to see them.

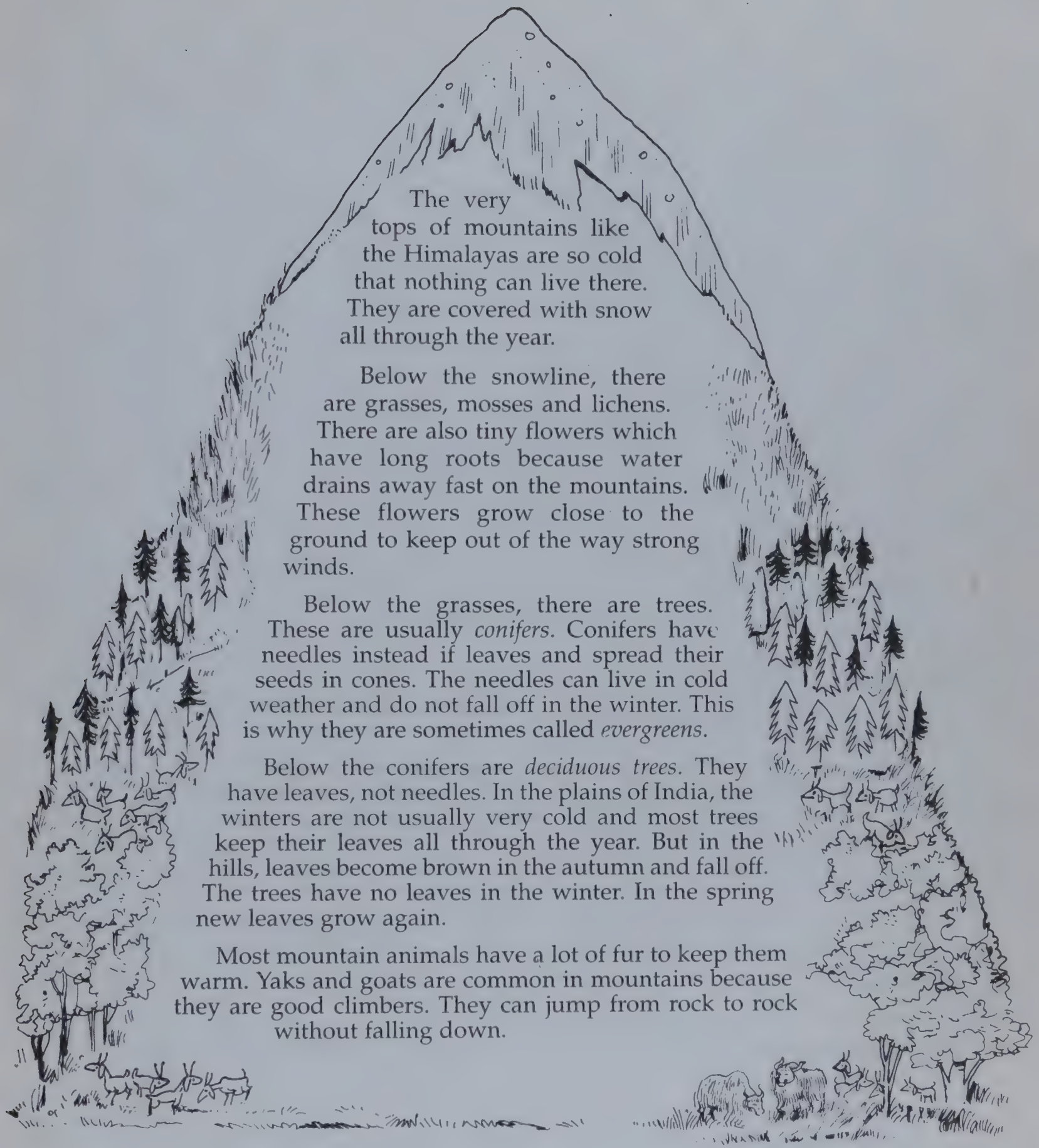
Hardly any plants can grow in these cold places—just a little moss on the rocks and a few fast growing plants if the ice melts in the summer.

Explain in your own words how the following plants or animals adapt to their environment :

1. a water beetle
2. a camel
3. a cactus
4. a polar bear

F. Life in the mountains

The higher you go, the colder it gets. If you have been to a hilly place, you will remember how you adapt to the cold climate by putting on woollen clothes to keep warm. Animals and plants also adapt to the cold temperature and high winds of the mountain.



The very tops of mountains like the Himalayas are so cold that nothing can live there. They are covered with snow all through the year.

Below the snowline, there are grasses, mosses and lichens. There are also tiny flowers which have long roots because water drains away fast on the mountains. These flowers grow close to the ground to keep out of the way strong winds.

Below the grasses, there are trees. These are usually *conifers*. Conifers have needles instead if leaves and spread their seeds in cones. The needles can live in cold weather and do not fall off in the winter. This is why they are sometimes called *evergreens*.

Below the conifers are *deciduous trees*. They have leaves, not needles. In the plains of India, the winters are not usually very cold and most trees keep their leaves all through the year. But in the hills, leaves become brown in the autumn and fall off. The trees have no leaves in the winter. In the spring new leaves grow again.

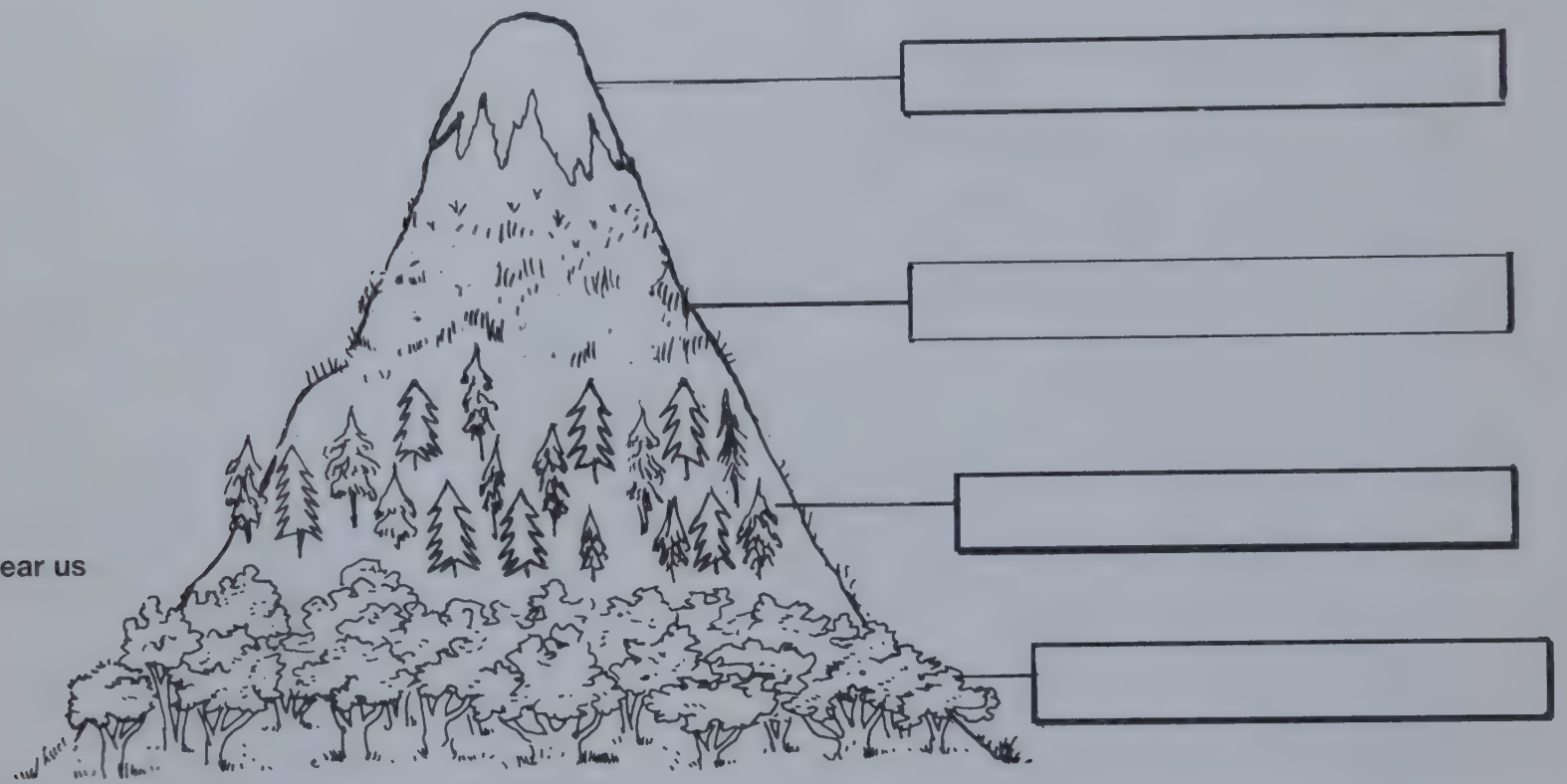
Most mountain animals have a lot of fur to keep them warm. Yaks and goats are common in mountains because they are good climbers. They can jump from rock to rock without falling down.

Sadly, many mountain habitats in India are changing too. People are cutting down trees on mountains for building houses, making furniture and for firewood and they are not planting more trees. So there are very few roots to hold down the soil. This makes the soil loose and causes landslides.

It is very important to save our trees and plant new ones.

This is a diagram of the plant life at different heights of a mountain. Copy it into your exercise books and label it with the words in the box.

deciduous trees	snow
grass, moss and tiny flowers	coniferous trees



G.Life near you

Wherever you live – even if you live in a big city – there is wildlife around you. There are lots of insects. You may not like some of them, but even flies and cockroaches are wildlife because they are free. There are birds in the trees. There are probably lizards, squirrels, rats and mice somewhere near or in your house. There may also be monkeys, scorpions, snakes, frogs or chameleons. Look for the wildlife in the picture below.

Each of the creatures you see in the picture has its own habitat. The lizards probably like the wall near the light because they can eat up the insects which fly around it. Frogs and mosquitoes perhaps like the water in the bathroom and the mouse probably lives in a hole behind the food cupboard.

In towns, the wildlife adapts to living near people. Monkeys and rats steal from people's kitchens. Parrots and squirrels steal from people's fruit trees. Mosquitoes drink our blood!

Chameleons are the greatest adaptors because they use camouflage. They change colour so that their enemies will not see them. If they are hiding in the grass, they turn green. If they are hiding on the tree, they turn grey or brown like the colour of the tree trunk.

chameleon

Complete this table about the wildlife in or near your home. You may put several creatures in one box. You may put one creature in several different boxes. You may put nothing in a box. Put in as many creatures as you can. (You may wish to put different habitats in your table. For example, you may want to say which species of tree different creatures like.)

Habitat	Reptiles	Amphibians	Mammals	Insects	Birds	Other
Bathroom						
Kitchen						
On walls	*lizards*					
On the roof						
Every room	*lizards*					
...in trees					*crows*	
...in holes						
...outside						
...in holes	*lizards*					
...inside						
others						

H. The changing environment — soil erosion

You learnt earlier that all plants need good soil. You also learned that the soil is usually only a few feet deep. Underneath it is rock and only very few plants can live on rock. But in many places, the soil is getting thinner. When it rains, the soil is washed blow away. When the wind blows the soil is blown away. This is called *soil erosion*.

Dust storm

The soil in hilly areas is washed downhill, so it becomes difficult to grow crops. This is happening in the Himalayas. The soil goes down to the plains and fills up the rivers. Then, when it rains, the rivers begin to overflow. This is happening in the plains all over Northen India.

The river is flooding because it is full of soils from the hills.

THE REASONS FOR SOIL EROSION

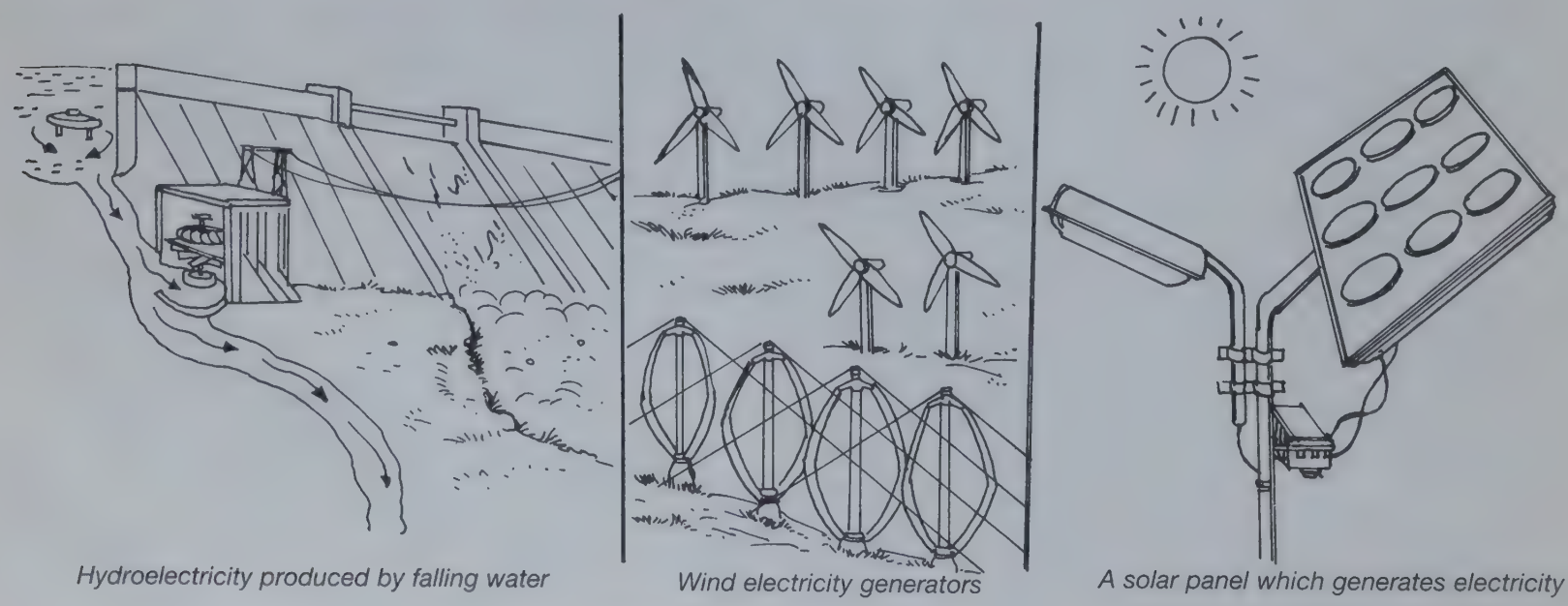
In this unit we have learnt that too many trees are being cut down. This is not just in rainforests and mountain forest regions, but also all over the world. When trees and shrubs are cut down, there are no roots to hold down the soil.

Goats and cattle are also a danger to trees. Many young trees die because goats eat them. If we keep too many animals, there will be fewer trees.

HOW TO STOP SOIL EROSION

We can stop soil erosion by planting trees. Every time we cut down a tree, we should plant two or three in its place. We must also make sure that nobody cuts down the forests which we still have.

We must try to find other fuels so that people do not use firewood. Gas and kerosene are expensive for poor people. They also *pollute* the air. Now scientists are learning how to make electricity from the sun's heat. This is called *solar energy*. We can also make electricity from waterfalls, the wind and the tide. If we can make this kind of electricity, we will not need to cut down trees for firewood.



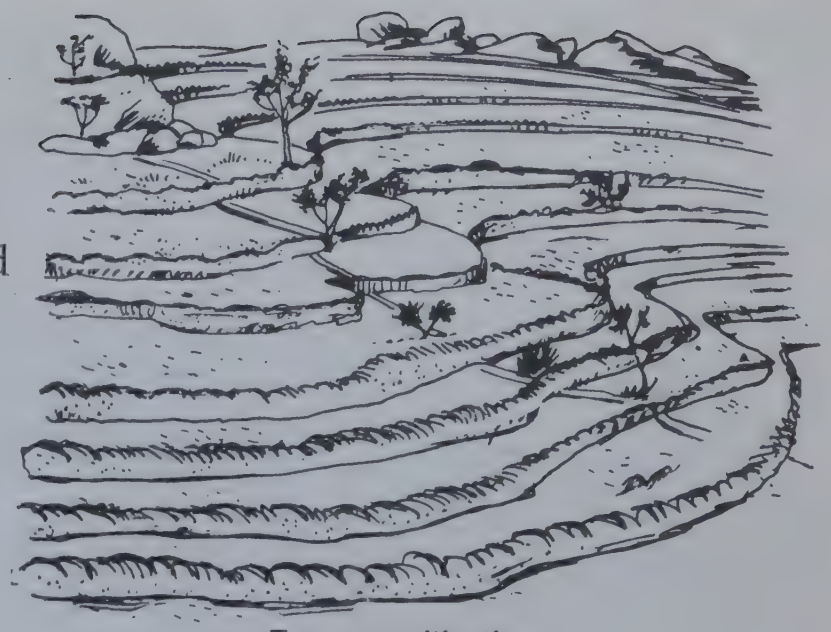
Hydroelectricity produced by falling water

Wind electricity generators

A solar panel which generates electricity

Different sources of energy

In hilly areas, we can stop soil erosion by building *bunds*. Bunds stop the water from flowing fast across the land. They hold water back so that it sinks into the soil. Many hill farmers make flat steps called *terraces* in the hillside. These also stop soil erosion.



Terrace cultivation

Look at the suggestions in the bubble below and write down the actions which could help to stop soil erosion.

Keeping more goats.

Growing more trees and shrubs

Making bunds at the edge of fields

Selling people fuel which is cheaper than firewood

Cutting down trees at this edge of fields

Making terraces on hillsides

Revision

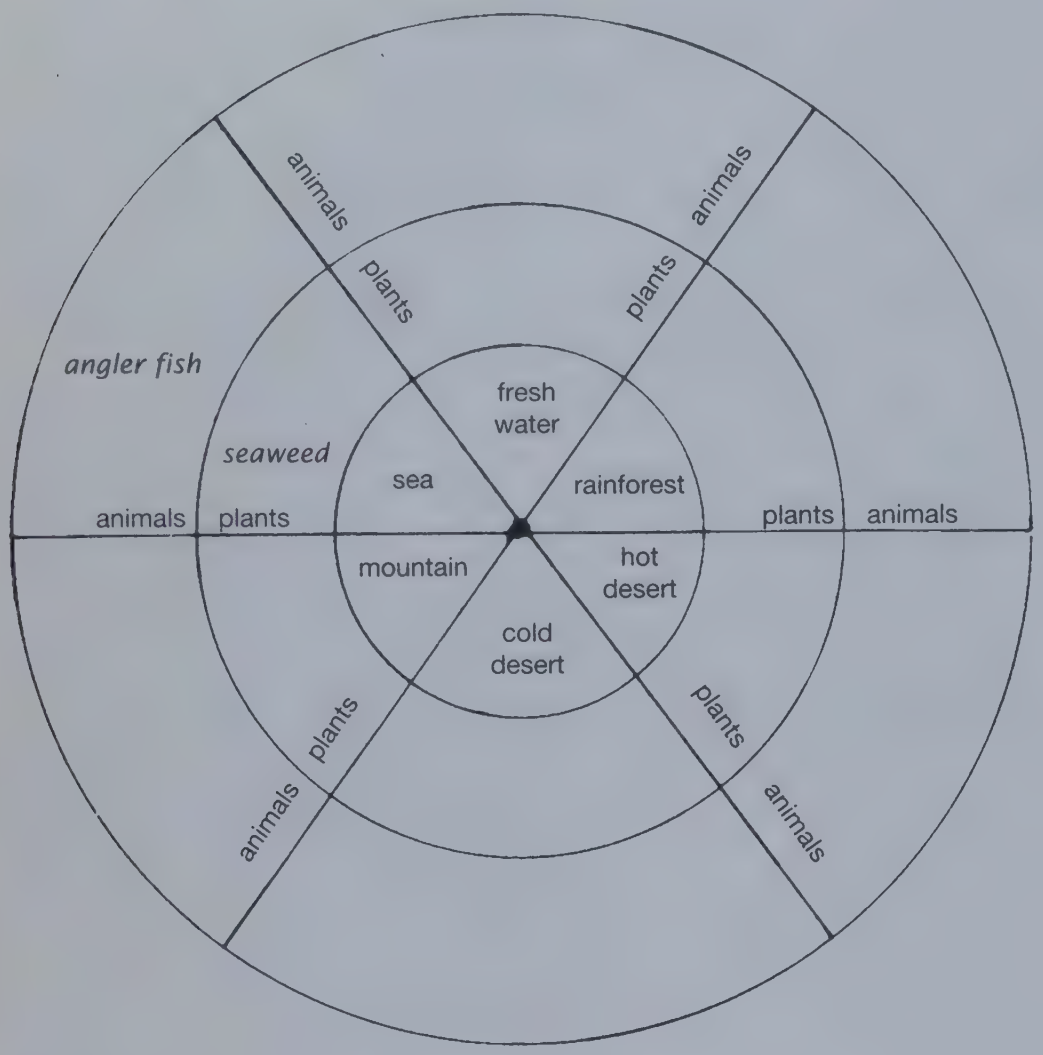
I. Match the living things to their habitats:

1. cacti	cold, hilly habitats.
2. mosquitoes	warm sea habitats.
3. polar bears	warm, damp habitats.
4. pine trees	very cold coasts and snowy habitats.
5. sharks	hairy habitats.
6. lice	hot,dry habitats.

II. Answer the following questions.

1. What are plankton?
2. Why don't many fish live deep down in the ocean?
3. Why don't water boatmen sink when they walk on water?
4. Do a lot of species or do only a few species live in rainforests?
5. What is a desert? Is it always hot?
6. How do most animals in cold deserts keep warm?
7. What is the difference between an evergreen tree and a deciduous tree?
8. Which usually live higher up on mountains — evergreens or deciduous trees?
9. How does a chameleon camouflage itself?
10. What is soil erosion?

III. Make a habitat chart. Copy the diagram below into your exercise book, using a compass to make the circles. Put all the living things in the box into the right part. There may be more than one in each part. Add some more of your own.



angler fish
polar bear
pine tree
liana
Arctic fox
water boatman
seaweed
cactus
camel
starfish
arrow-poison frog
lotus
iguana
scorpions
yak
mosquito larva
moss

Extension work

I. In your own words, describe how people are harming :

1. life in the sea,
2. life in rainforests,
3. life in mountains.

Write your own ideas about how we could stop harming these habitats.

For the teacher :
Get the children into groups of three or four. Ask each group to draw and colour a scene of one of the habitats studied in this unit. If possible, let them work on large sheets of chart paper which can be displayed around the classroom. Encourage them to use reference books as a basis for their pictures. Finally, each group can prepare a talk about their chosen habitat for the rest of the class.

UNIT 3

Dangers to the environment

Key words

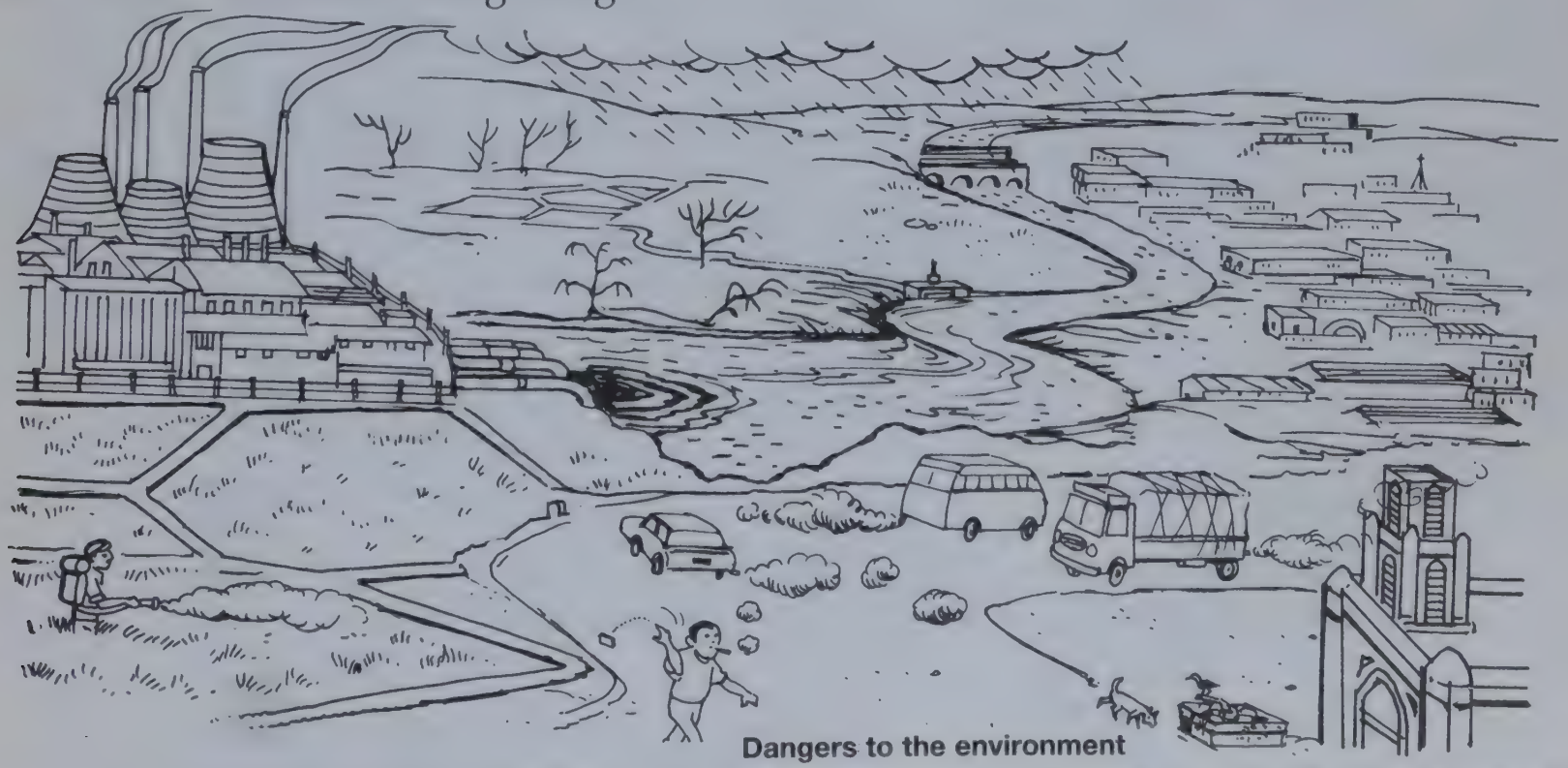
conserve: to protect nature and keep in a safe state e.g. *We must conserve our natural forests.*
conservation: protection and preservation especially of natural resourses
ecology: The study of living things in their environment e.g. *When we learn about ecology, we learn about the ways people affect their environment.*
endangered: in danger of dying out e.g. *The Indian tiger is an endangered species.*
population: the number of people living in a place e.g. *The population of this town is five lakhs.*

A. What is ecology?

In Class 4, we learnt the word *environment*. The environment is the world around us. Your environment is your home, your school, your street, your town.

Your environment is also the whole world. The Amazon rainforest is far away but if it disappears, there will be less oxygen here in India. The weather all over the world could change too if a big change takes place in some part of the world.

This unit is about dangers to the environment. It is also about ecology. When we learn about ecology, we learn about living things in their environment. We learn about the way plants and animals (including people) affect each other. We learn how to share our world with other living things.



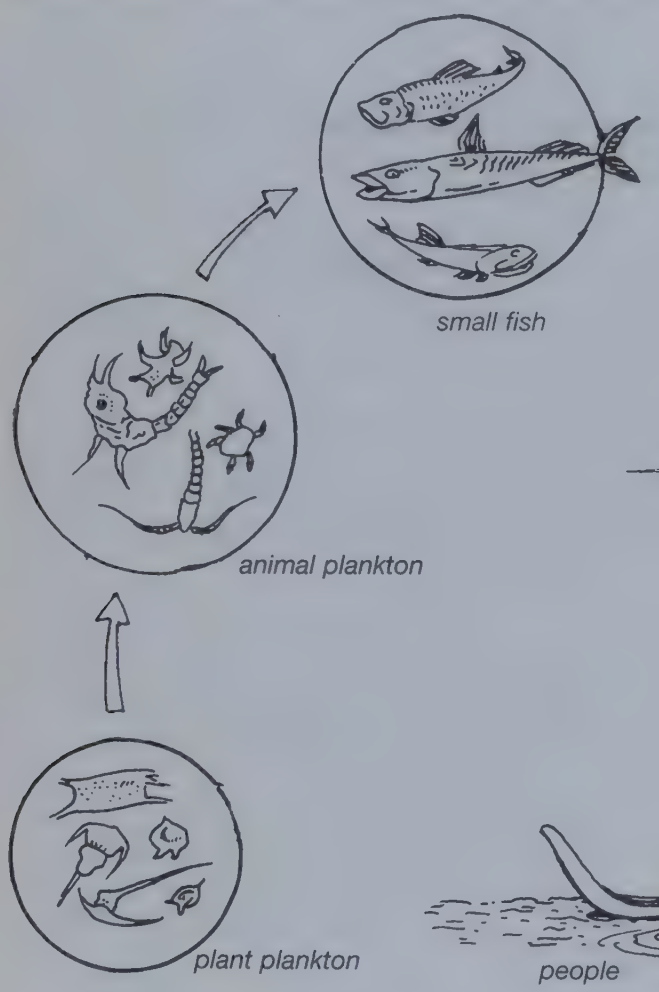
Dangers to the environment

Look at the picture above. Write a list of the things in the picture which can harm the environment.

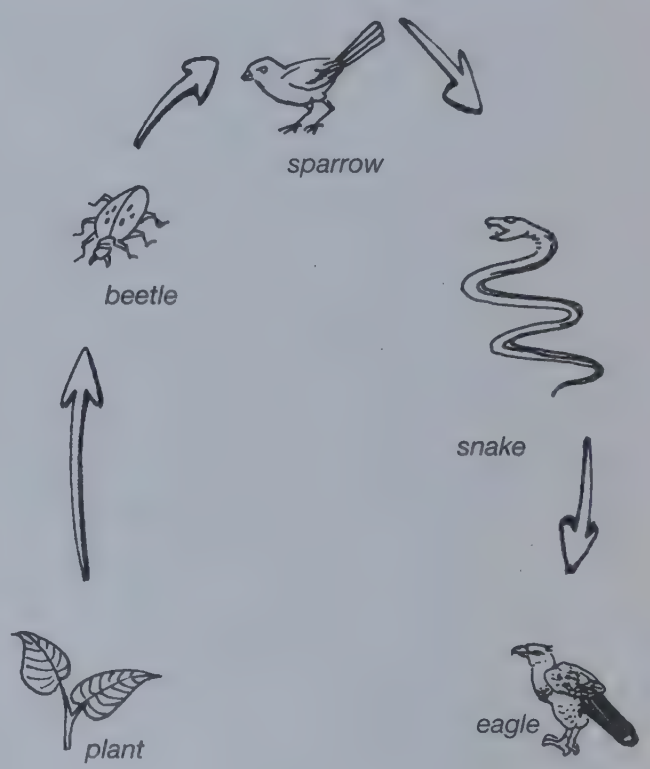
Thousands of years ago, human beings lived along with nature and did not change it. In the past few hundred years, people have become more and more dangerous to the world. We have turned a lot of forests into farm land. We have killed many species of animals. We will now learn about some of the ways we are harming our world. We will also learn how we could look after it.

B. Food chains

The only living things which make their own food are green plants. They make their energy from the sun's light. Other living things have to eat plants. Or they can eat other animals which eat plants. All, in the end, need plants. When food goes from one creature into another creature we say there is a *food chain.* All food chains start with plant life. Here are two food chains — one from the sea, and another from the land:



A food chain at sea



A food chain on land

A FOOD CHAIN AT SEA

These two simple food chains show that living things need each other. They also show that we must be careful about disturbing any food chain. Insecticides are poisons which kill insects. Pesticides are poisons which kill animals. Farmers use insecticides and pesticides to make sure that their fruits and vegetables are not eaten by insects and animals. These may kill beetles which eat their vegetables. They may also kill the sparrows which eat the beetles, the snakes which eat the sparrows and the eagles which eat the snakes.

We may be a part of this food chain ourselves. If we eat the vegetables from the same field, we may be poisoned too.

Nature has its own way of keeping down the number of insects and pests. Other creatures eat them. For example, frogs eat many insects. So we must conserve frogs. It is better to encourage natural killers of harmful insects than to use pesticides. Remember : If one link in a chain is broken, the chain does not work. We must be careful not to break nature's food chains.

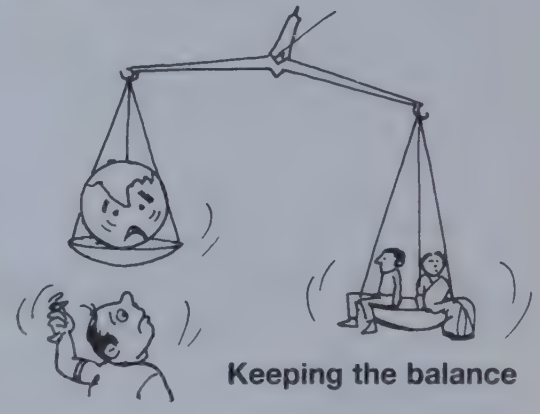
Did you know ?

Recently in Kerala thousands of frogs were caught and sold to France. (Some French people eat frogs' legs.) Because of this, there were many more insects and the farmers' crops were eaten up.

Remember there is a balance between all the living things in the world. They all need each other. If we try to play with nature, we may upset the balance.

What can we do to conserve nature's food chains?

* We must be careful not to use too much pesticide and insecticide.
* We must be careful not to kill any species of life/even if we think it is of no use to us. We may break a food chain.
* We must be careful not to catch small fish with fine nets or there will be no food for bigger fish.



Keeping the balance

Think of two more food chains and write them down in your notebooks. Put pictures beside each one. Make sure there are at least three parts to each chain (e.g.rice-mouse-cat).

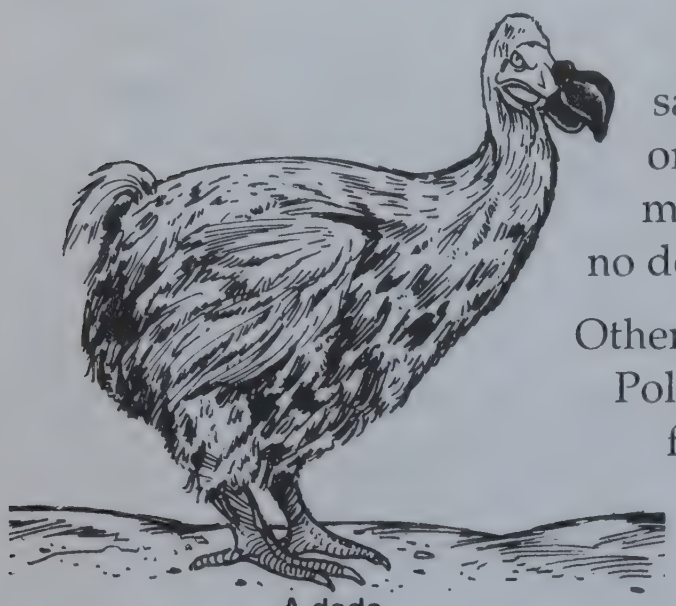
Pin up the different food chains on your classroom wall.

C. Endangered species

Because of some of the things we do, some species of animals and plants are dying. If their numbers are getting smaller, we say that they are *endangered;* that means they are in danger of dying out.

There are more and more people on the earth. This means that they need more and more land. So there is less room for wild animals. They are losing their habitats. For example, the Indian tiger is famous all over the world, but today there are very few tigers left. The jungles are getting smaller and there is no place for them to live.

Some species are endangered because of pollution. When a ship full of oil sinks, all the sea birds and fish in that habitat can be killed. During the Gulf War in 1991, for example, thousands of creatures in the Arabian Gulf died because oil was poured into the sea.



A dodo

When every plant or animal in a species dies, we say that the species is *extinct*. For example, there was once a big bird called the *dodo*. It was hunted so much that it became extinct in 1681. Now there are no dodos on the earth.

Other species are endangered because people kill them. Polar bears are killed for their fur. Elephants are killed for their tusks. Whales are killed for oil used in face creams. It is possible for us to do without many of these things, so it is greedy to kill these animals. It is good to know that now most countries have agreed not to kill animals needessly, especially endangered animals, but some people still do.

Many other lesser known animals and plants are endangered too. We must realise that if one species in a food chain becomes extinct, the creatures which eat it may be endangered too. They all need to be conserved. We must look after them.

What can we do about endangered species?

* We must not destroy the habitats of wild animals.
* We must look after our national wildlife parks, where wild animals can live safely in their natural habitat.
* We must make sure that we do not pollute the world.
* We should try not to buy things which come from endangered species (e.g.ivory and animal skins).

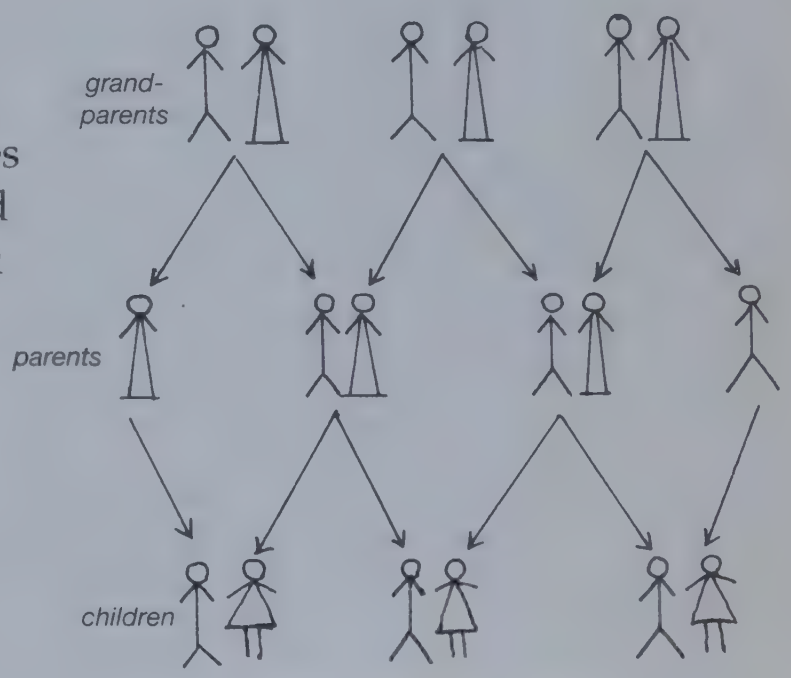
There are different reasons for some animal and plants species being endangered. Some of the reasons are given below. Find examples of the animals that are in danger in each case. The first one is done for you.

People kill animals for their fur or skin. e.g., seals
There are more people on earth so there is less room for wild animals, e.g., ...
People are polluting the habitats of plants and animals, e.g., ...
People kill animals to make face creams, e.g., ...
Pesticides are killing different creatures in food chains, e.g., ...
People kill animals for their tusks, skin, etc., e.g., ...

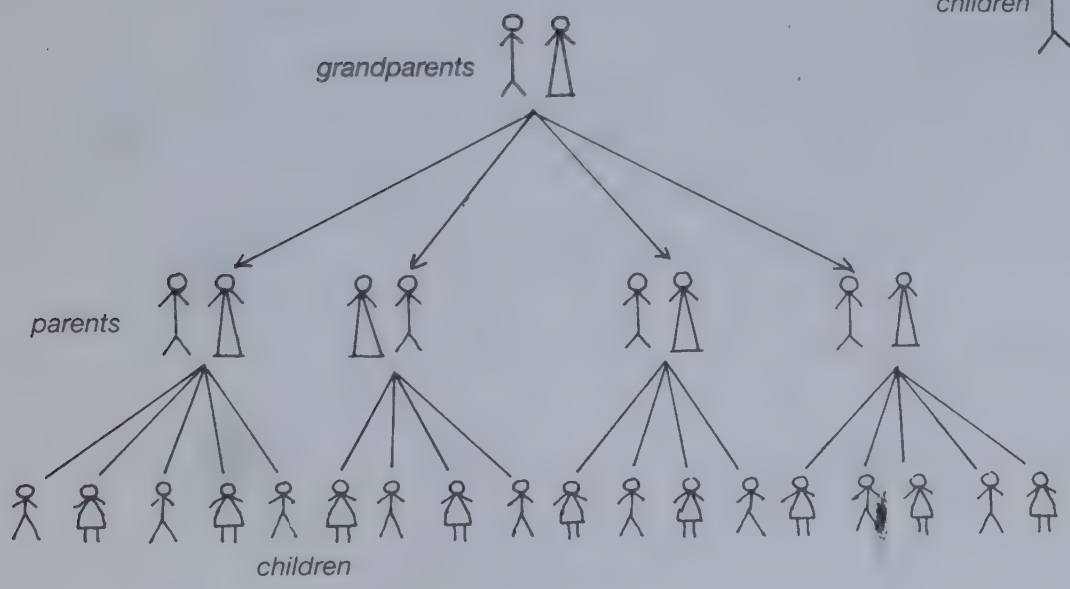
D. Population

In the last section, we learnt that animals are losing their habitats because there are more and more people on the earth. The number of people living in a place is called its *population*. The population of the world is growing very fast.

In the beginning, when human beings evolved, there were no doctors. Lots of babies and children died. If a husband and wife had ten children, about eight may have died. You can see from this diagram that if these two children lived to have more children, the population did not grow much bigger.

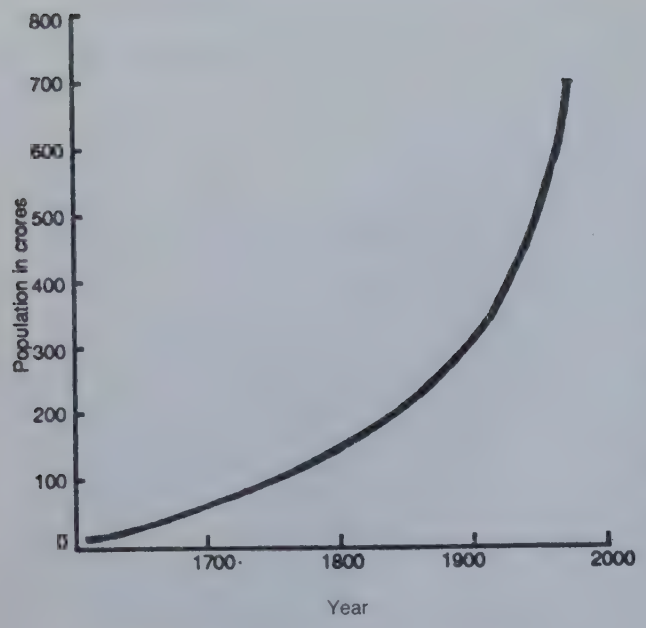


Slow population growth



Rapid population growth

But if more than two children live, the population grows. If four children live to have four more children, two grandparents will have sixteen grandchildren.



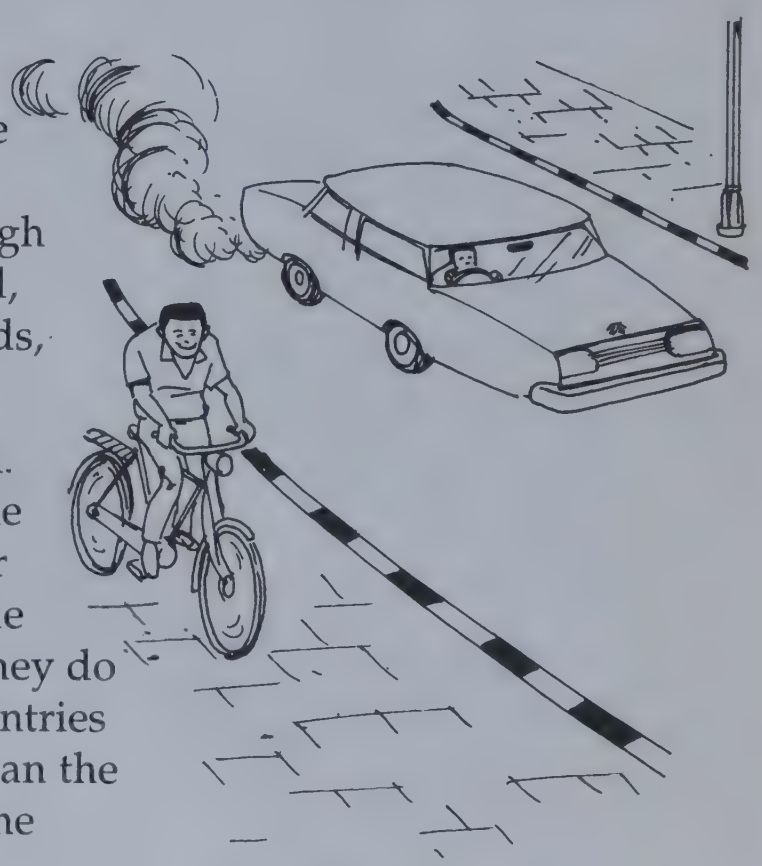
Graph showing world population

Until 1700, the population of the world did not change much. Then it started to grow very fast. About a hundred years ago, it started to grow rapidly. And it is still growing! This is because doctors have learnt more and more over the years. Health care is better. Now, fewer babies die and people live longer. So there are more people on earth.

All these people want land. So they cut down the jungle and make farms and houses. They cut down trees for firewood. They grow the plants they want for food. They catch, rear and kill the animals they want for food. Animals and plants which are not useful are in danger. People are also danger. As the population of the world grows, there will be more people to feed.

If people were good at sharing, there would still enough food for everyone. But many people do not like sharing. Much land is used to grow expensive things for some people, and not enough food is grown for other people. As Gandhiji said, 'This world contains enough for everyone's needs, but not for everyone's greed.'

More people will use more petrol, gas and coal. More people will cause more pollution. But some people do not pollute the earth as much as other people do. They do not use so many things made in smoky factories. They do not have cars and they do not use so much electricity. Some of the rich countries in the world cause forty times more pollution than the poor countries. The growing population is not the only problem!



Who is the polluter?

What can we do about population growth?

* We can have small families.
* We can share the food in the world fairly. This means that each one of us must not take more than we really need and we must not waste food and other important things that are needed by everybody like water, fuel and petrol.
* We must be careful not to pollute the world.

Which of the following statements a,b or c would you choose.

1. The population of India is
   a) the pollution in India.
   b) the number of people in India.
   c) the number of babies in India.

2. Before 1700, there was not much change in the population because
   a) people did not have many children.
   b) people had only two children.
   c) most children died.

3. The population of the world is growing because
   a) not so many babies and children die.
   b) there are not so many old people.
   c) there are no doctors.

4. a) There is not enough food for all the people in the world.
   b) There is enough food for all the people in the world if it is shared fairly.
   c) There is enough food for all the people in the world to eat anything they like.

5. a) The rich countries in the world pollute the earth more than the poor countries.
   b) The poor countries in the world pollute the earth more than the rich countries.
   c) We must all get rich so that we can pollute the world too.

8. We can stop the world's population from growing if
   a) we don't buy cars.
   b) we don't have a lot of children.
   c) we stop eating sweets.

E. An experiment with water pollution

You will need (for each group):

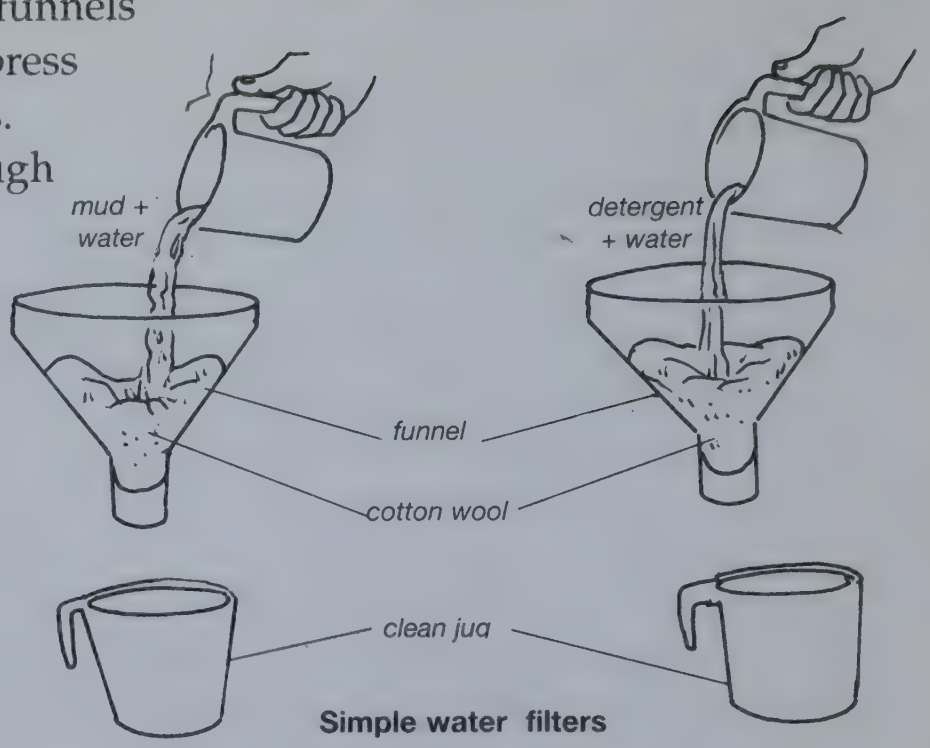
* two large funnels (e.g. for pouring kerosene into a stove), two big wads of cotton wool,
* a jug of muddy water,
* a jug of water with a large spoon of detergent powder dissolved in it,
* two clean, empty jugs.

In Class 4, you learnt about pollution of air, land and water. You also learnt how to filter the dirt out of water with a water filter. Today you are going to find out if a filter can clean all kinds of polluted water.

Make two simple water filters with funnels and cotton wool. Make sure that you press the cotton wool firmly into the funnels. Slowly, pour some muddy water through one filter.

Dissolve a large spoon of detergent in a jug of water. Then pour the detergent solution carefully through the second filter.

In your exercise book, write your guess about what will happen before you do the experiment. Add your reasons or other guesses if you want to. You can write like this:



Simple water filters

When the water comes through the filters I think that

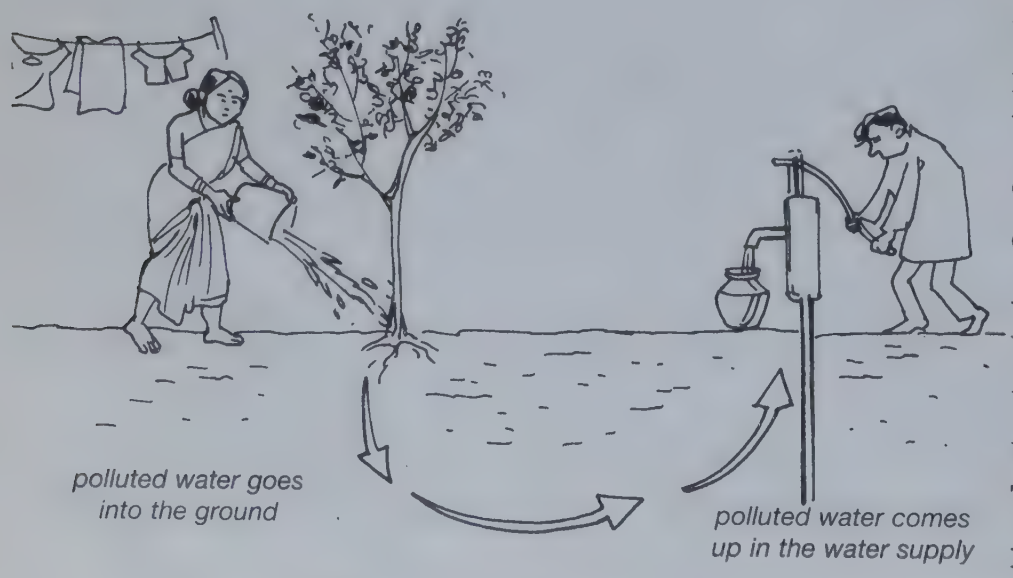
a) there will be no mud or detergent in the water.

b) there will be mud and detergent in the water.

c) there will be mud, but no detergent in the water.

d) there will be detergent, but no mud in the water.

After you have written your possible guesses, look at the water. Is the first jug muddy? Stir the water in the second jug with your finger. Do bubbles form? If they do, there is detergent in it.



Polluting underground water

If you did the experiment carefully, you probably found that the cotton wool filtered the mud out of the muddy water. You also probably found that the cotton wool did not filter the detergent out of the water. Almost all of us use detergent when we wash our clothes. If we throw the water on the ground, it will go down into the earth. Then the detergent may come into wells and pump water.

Factories sometimes, let out polluted water into streams, lakes and rivers. Some kinds of dirt like mud can be filtered. But many factories do not use filters because they cost money. Other kinds of dirt like detergent cannot be filtered. The water may poison fish and other water plants and animals. The water may also sink into the ground. Then it pollutes the water which animals and people drink.

Factories cause pollutions

Fertilisers and chemical can be dangerous

Farmers sometimes use fertilisers to make their crops grow well. They may get a good crop, but the fertilisers can contain dangerous chemicals. These go into the soil and into the water under the ground. Then plants, animals and people can be poisoned. The chemicals may make some water plants grow so much that there is no room for other water life.

People pollute water when they use banks and shores near rivers and canals as toilets.They pass on their germs to other people and so diseases spread. Sadly, many people are too poor to have toilets. This is a big problem. People also pollute the water and the ground when they leave their rubbish on the streets.

What can we do about water pollution?

* Factories must stop putting polluted water into rivers, the ground and the sea.
* Farmers must be very careful not to use too much fertiliser.
* People should use toilets with flushes if possible.
* We must not leave rubbish in the street.

In your own words, describe the experiment with water filters. Write it in three paragraphs under the following headings:

1. The materials we used
2. How we did the experiment
3. The result of the experiment

F.Acid rain and living things

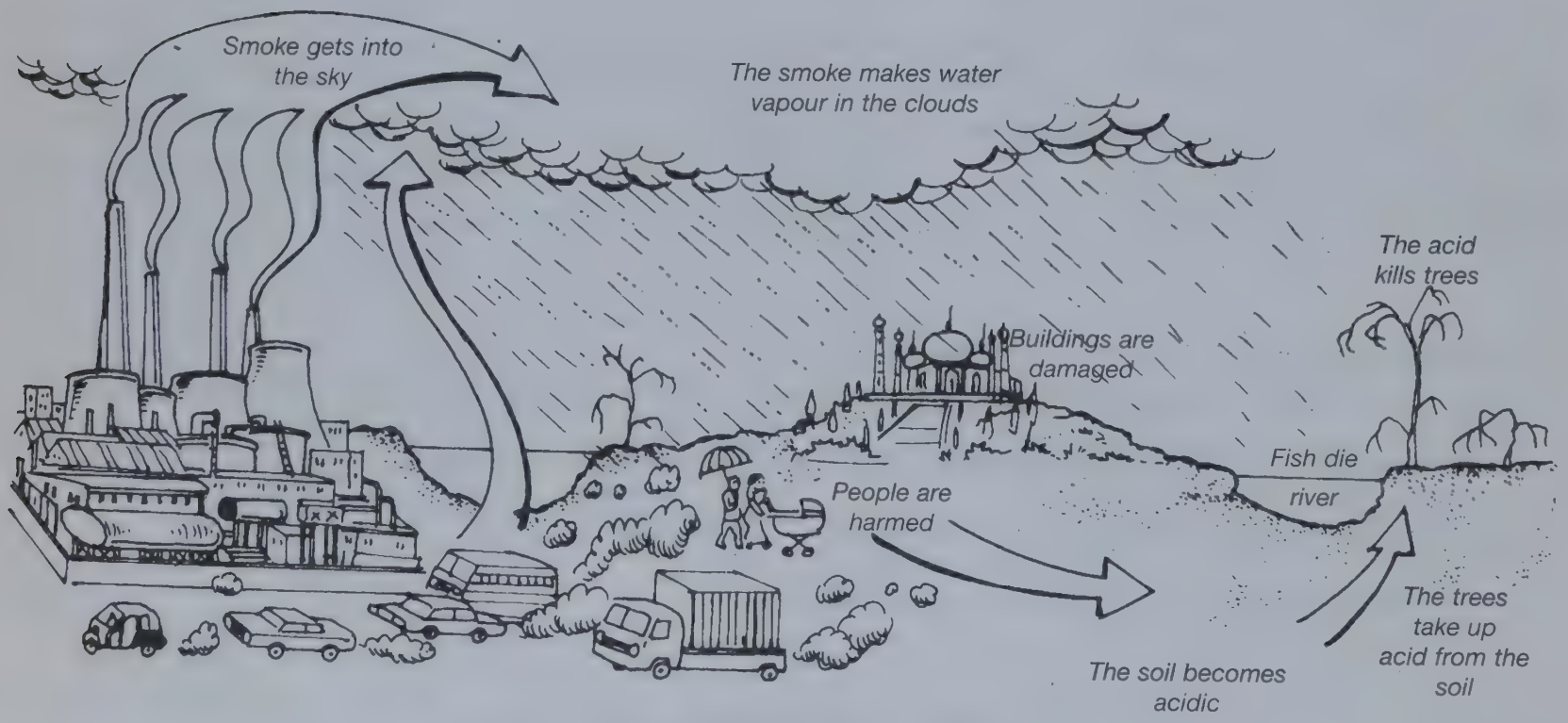
Farmers can harm wildlife by using insecticides and too much fertiliser. Factories can also harm wildlife. They can pollute the air with their smoke and the rivers with their waste.

Many factories burn coal, oil and gas. A lot of power stations make electricity by burning oil, gas and coal too. These are called *fossil fuels*. They give out a lot of smoke.

Cars, lorries, buses and motor cycles burn petrol. They give out smoke in their exhaust. This smoke pollutes the clouds. As a result the rain is not pure water. It is mixed with acid.

Acids can be dangerous for people. For example, lime is *acidic*. You know that if lime juice goes into a cut on your body, or into your eye, it hurts. Imagine what it would be like if the rain was made of lime juice. Actually, the rain is not as acidic as lime juice. But near cities and factories, trees are beginning to die because of acid rain. Fish in lakes are dying too. In some places, the soil is becoming so acidic that plants and trees do not grow well.

Acid rain is even damaging the Taj Mahal.


Smoke gets into the sky
The smoke makes water vapour in the clouds
The acid kills trees
Buildings are damaged
Fish die
river
People are harmed
The trees take up acid from the soil
The soil becomes acidic

Acid rain and our environment

Factories could filter their smoke. Cars could filter their exhaust. But this costs money. Most factory owners and car makers don't want to spend money. But if they don't, we will pay for our factories and cars with dead crops, dead trees and dead fish.

What can we do about acid rain?

* We can put filters on motor vehicles and factory chimneys.
* We can make electricity using water power, wind power and the sun's power (not fossil fuels).
* We can try to save electricity.
* We should walk or cycle on short journeys instead of going by motor vehicles.

Answer these questions.

1. Why don't many factories filter dirt out of their waste water?
2. Can a filter take all kinds of pollution out of water?
3. What do some fertilisers do to water plants?
4. Why is it bad to go to the toilet by the road side?
5. Name three fossil fuels.
6. Name three vehicles which use fossil fuels.
7. What happens to rain if it mixes with a lot of fossil fuel smoke?
8. Name two living things which can be harmed by acid rain.

G. The greenhouse effect and living things

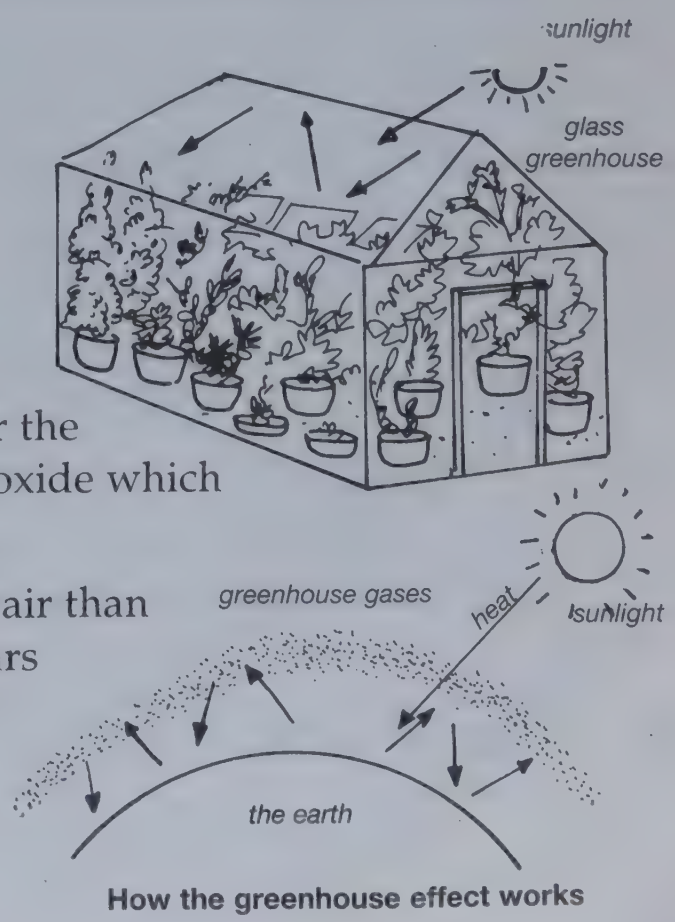
You will need:

* a plate of water, some ice cubes, the lid of a jar,
* if you wish, a small plastic toy.

In cold countries, people often grow vegetables in glass houses called *greenhouses*. The sunlight comes through the glass. It heats the vegetables, but the heat cannot get out because of the glass. So the vegetables keep warm.

Now there is a layer of polluted air all around the world. This polluted air acts like a big glass roof or *greenhouse*. It lets sunlight in and keeps the heat near the earth. The polluted air contains gases like carbon dioxide which we call *greenhouse gases*.

Nowadays there are more greenhouse gases in the air than there used to be. All over the world, factories and cars burn fossil fuels. The smoke that they give out is full of greenhouse gases so the world is getting hotter. This is called *the greenhouse effect*.



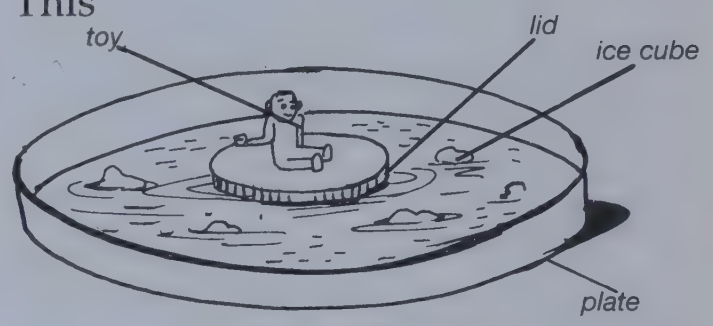
How the greenhouse effect works

As the world gets hotter, life on earth could change. Animals and plants may die as the weather gets hotter. They are used to their habitats. If their habitats change too quickly, they may not be able to adapt in time. Crops which used to be grown in certain places may not grow at higher temperatures.

The warmer temperatures may also melt some of the ice in the Arctic and the Antarctic. So there would be more water in the sea. Cities near the sea – like Madras and Bombay – could be flooded. These things may not happen for fifty or a hundred years. But if we go on burning petrol, gas and coal, as we are doing now, there will be more and more carbon dioxide in the air, and the earth will get hotter.

We must find other ways of running our cars, buses and factories.

An experiment : Put the lid of a jar in a deep plate. This is your island. If you wish, put a small, plastic toy on the lid. Imagine that it lives on the island. Then fill the plate with water until the water is just below the level of the lid. Put some ice cubes into the water.



How the land gets flooded

Leave the ice cubes until they melt. Then see if the water has flooded over the lid. If the water comes up to the toy, it has drowned.

Animals and plants will drown in the same way if the ice-caps in the Antarctic and Arctic melt.

What can we do about the greenhouse effect?

* We should follow the same steps as those for acid rain.
* We must also stop cutting down trees because they take in carbon dioxide which is one of the greenhouse gases.

I. Answer the following in your own words.

1. Why is there more carbon dioxide in the atmosphere than there used to be?
2. Explain why Madras may flood in fifty or hundred years time.
3. If you did the experiment with the ice cubes, describe what happened.
4. Write at least four things we can do to lessen the greenhouse effect.

II. Draw diagrams

1. to show how a glass greenhouse keeps warm in the sun's heat.
2. to show how carbon dioxide keeps the sun's heat near the earth.

H. Nuclear power

Science has helped people in many ways, but in other ways it can be dangerous. People have invented things which could destroy life on earth.

In 1945, America dropped the first nuclear bomb. It was more powerful than any other bomb in the world. It destroyed a whole city in Japan. Nuclear bombs are dangerous because they blow up people and destroy buildings. Worse than this, they pollute the air with *radiation* that they give out. This can give people cancer and other deadly illnesses. Many countries now have nuclear bombs. If all these bombs were used, everyone on earth could be killed.

A nuclear explosion

Nuclear power is not just used in bombs. It can also be put to good use, for example, to make electricity in nuclear power stations. This is all right until there is an accident. But it is important to remember that an accident could kill thousands of people

Did you know?

In 1986, there was a big accident at Chernobyl Nuclear Power Station in the Ukraine. Radiation spread all over Europe. Many years have passed since then but people who were near the power station at that time are still dying of cancer and heart diseases as a result of the accident.

Even though we know how to make electricity from nuclear power, we do not know how to take the radiation out of the waste that is given out. There could be an accident at any time with all the waste which is buried under the ground and dumped into the sea.

What can we do about the dangers of nuclear power?

* We must never use nuclear bombs. They will kill or greatly harm us as well as our enemies. They will also destroy animals, plants and our environment.
* We must find other ways of making electricity (e.g. from water power, the wind, the tides and the sun).

Make true sentences, using some of the words in the box (there are more than you need):

radiation	waste	carbon dioxide	country	malaria	electricity
1968	1986	1945	cancer	power station	recycling plant

1. The first nuclear bomb was dropped in _____ .
2. Nuclear bombs spread_____ .
3. Radiation can cause_____ .
4. Nuclear power can be used peacefully to make_____ .
5. Chernobyl is the name of a _____ .
6. Radiation came out of Chernobyl in_____ .
7. Nuclear_____ is often buried under the ground or at sea.

Revision

You will need:

* a large sheet of paper for each pair of children, colours or paints.

I. Teach others in your school about conservation. Design a poster exhibition to put in the corridors and staircases. Each pair of children should make one poster.

Discuss the ways we are harming our earth. Make a list on the blackboard. You should think of at least ten or fifteen problems. Use what you learned in Unit 2 as well.

Your poster should have:

a short, snappy slogan in large letters,
one or two sentences about the problem,
one or two sentences about what we can do,
a colourful, eye-catching picture.

II. Match these words to their meanings.

ecology	oil, gas and coal
pesticide	the protection of nature
conservation	the slow warming of the earth
population	a poison which kills harmful animals
fossil fuels	the number of people who live in a place
greenhouse effect	the study of living things in their environment

III. Match these problems to things you can do to avoid them.

Poisoned food chains	Save electricity and put filters on factories and motor vehicles.
Endangered tigers	Protect wild animals in wild life parks.
Overpopulation	Don't make electricity with nuclear power.
Acid rain and the Greenhouse effect	Don't have too many children.
Nuclear accidents	Don't use pesticides and insecticides.

Extension work

Find out about environmental problems in your area. Think what you can do about them. Here are some suggestions:

1. Write letters about pollution in your area to your M.L.A., M.P. or your local newspaper.
2. Pick up waste paper in your school grounds.
3. Plant some trees in your school grounds.

UNIT 4

Keeping fit and healthy

Key words

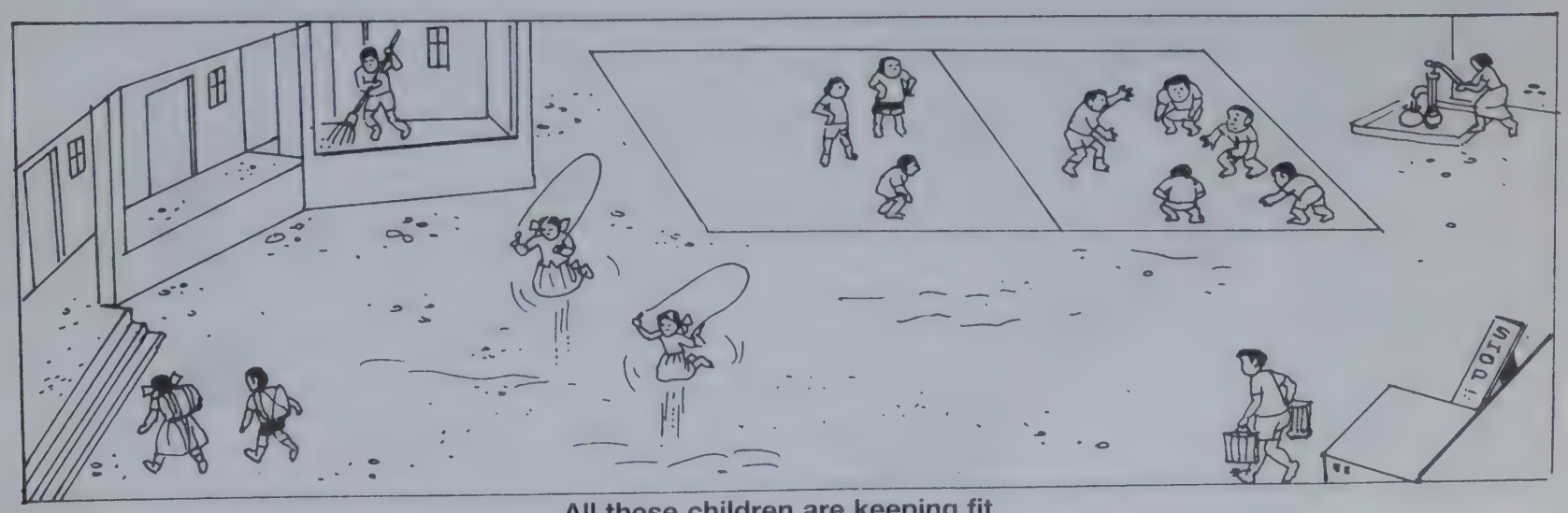
contract : to get shorter e.g. *Many things contract when they are in cold surroundings.*
fit : well, having a strong body e.g. *He's a fast runner because he's very fit.*
malnutrition: not enough food or the right kinds of food
malnourished : having malnutrition e.g. *She is malnourished because she doesn't eat enough protein.*
posture : the way you sit or stand e.g. *He has good posture because he keeps his back and head straight.*
prevent : to stop something from happening e.g. *The doctor prevented me from getting rabies by giving me an injection.*
recycle : to use again e.g. *Used paper is cut up, washed and made into new sheets of recycled paper.*

A. Keeping fit

In Class 4 we learnt about two ways to keep healthy. We learnt about the right kinds of food to eat. We also learnt that we must keep our food and houses clean. In this unit we will learn more about how to keep healthy. We will also look at some ways of keeping fit.

We all need to exercise every day. If we do so, we become fit. The more we walk and run, the healthier we become. So it is good for us to play games like catch, kabbadi, football and cricket. We also exercise our bodies when we do useful work. If we help with the housework, we are getting exercise. If we walk to school, we are exercising. If we help to carry the shopping home, we are exercising.

It is good to breathe fast and sweat a little. It makes our bodies stronger. If our bodies are strong, we don't fall ill easily.



All these children are keeping fit

A fitness test : Go outside and run some races. You may need to do this in groups of six. The first two in each group go into the final race to see who are the fittest people in your class. After the race, notice the changes in your breathing, heart beat and sweating.

Answer these questions :

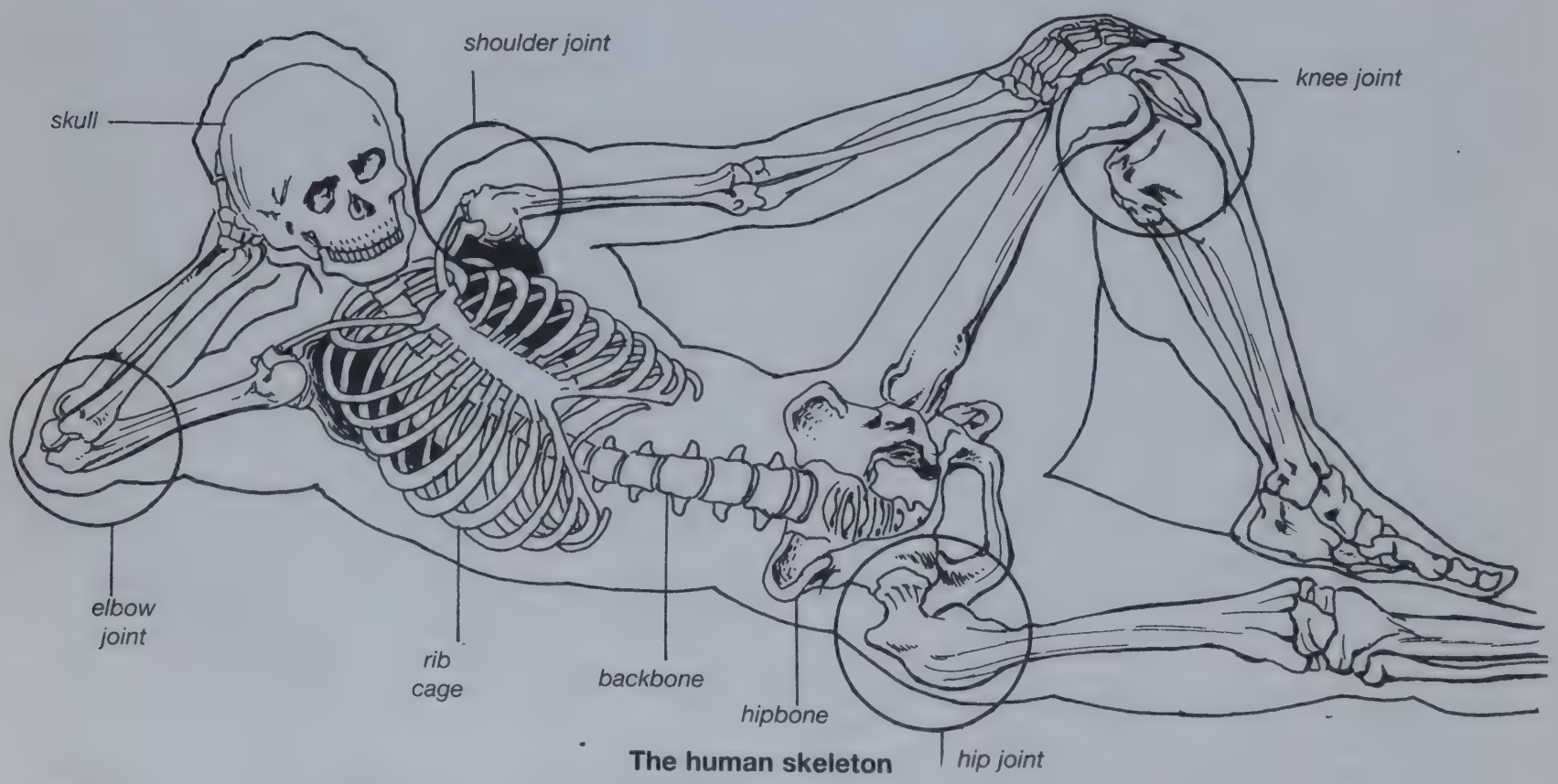
1. Who are the five fittest people in your class?
2. What happened to your breathing after the race?
3. What happened to your heartbeat after the race?
4. What happened to your sweating?
5. What exercise do you take every day?
6. What kinds of exercise do you enjoy most?

B. Strong bones and joints

You will need (if possible) :

* a radio with a movable aerial i.e. one that has a ball and socket joint.

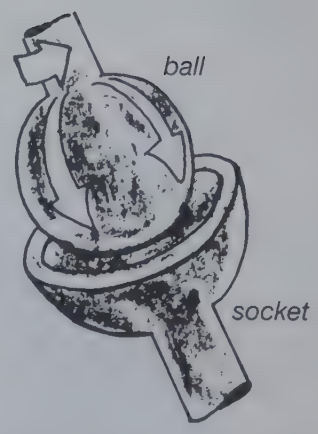
We would not be able to exercise our bodies without our bones and muscles. We would not even be able to move. Here is a diagram of the human skeleton. Look at each part carefully.



The human skeleton

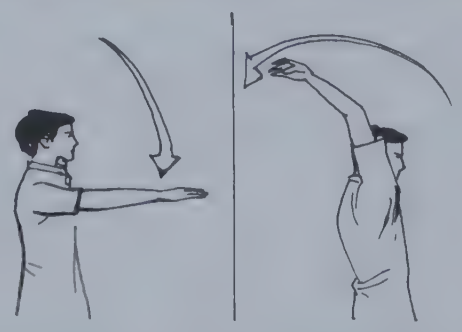
Bones keep our bodies in shape. Some bones help us to move. These bones have moving joints. A *joint* is the place where two bones join with each other. For example, the hip and shoulder joints help us to move our arms and legs.

We can move the hip and shoulder joints in lots of directions. These are called *ball and socket* joints because the top of the arm and leg are ball-shaped. The ball fits neatly into a socket in another bone. It is rather like the way you can move the aerial around in some radios or transistors. Test your own ball and socket joints. Swing your arms forwards, over your head and then behind you. You should be able to turn them in a circle.

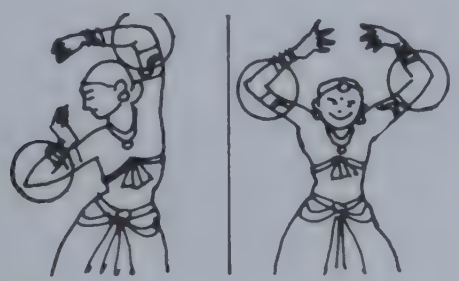


The ball and socket joint

The ball and socket joint in the shoulder moves in many direction



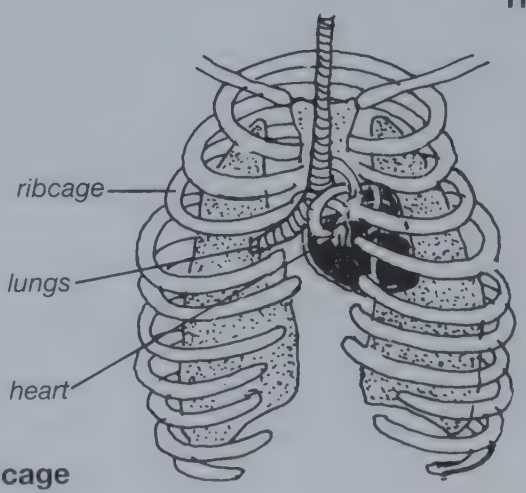
The elbow joint and knee joint move only backwards and forwards. They are rather like the hinges of a door, so they are called *hinge joints*. Put your arm on your desk. Move your arm up to your shoulder. Then straighten it and try to move it the other way. It probably won't move.



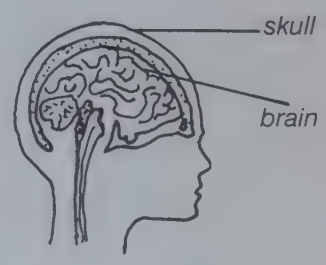
The hinge joint in the elbow moves only in one direction

The hinge joint

Other bones do not have moving joints because they protect the soft parts of the body. For example, the ribcage protects the lungs and the heart. The skull protects the brain.



The ribcage



How to have strong bones

If you want your bones to be strong you must do these things:

* Exercise regularly.
* Eat food containing calcium (eg. milk and eggs).
* Make sure that your posture is good. Stand and sit with a straight back.

Match the two parts of these sentences:

1.	A joint	moves in many different directions, e.g. a hip point.
2.	A hinge joint	contains calcium.
3.	A ball a socket joint	protects the brain.
4.	The skull	is the place where two bones connect.
5.	The ribcage	moves only in one direction, e.g. a knee point.
6.	The best food for bones	protects the lungs.

C. Strong muscles

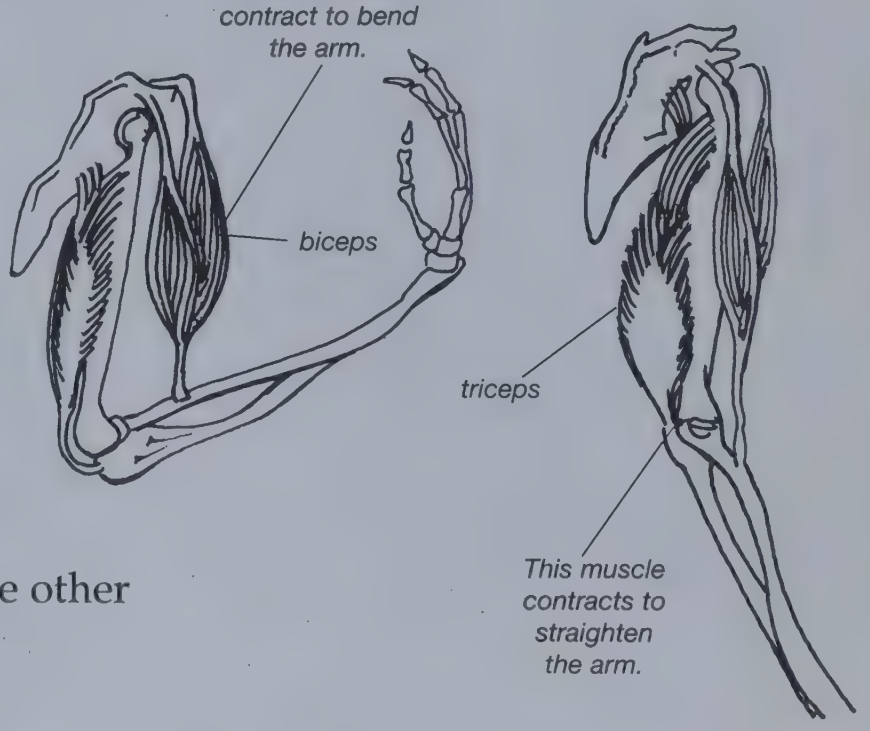
You will need for each pair of children :

* a strip of card (e.g. from the side of a strong box) about 20 cm by 5 cm, two rubber bands, some sellotape.

We would not be able to move without muscles. We would not be able to run, blink our eyes, lick our lips or twitch our toes. Some muscles can be controlled. For example, if you want to eat a biscuit, you make your arm and finger muscles pick it up and bring it to your mouth. You make the muscles in your mouth chew it and swallow it.

Then it goes down to your stomach. You do not control the muscles in your stomach. They work by themselves. They mix the biscuit with juices so that you can digest it. Other strong muscles make your heart beat too, but you do not control these muscles either. They work when you are awake and also when you are asleep.

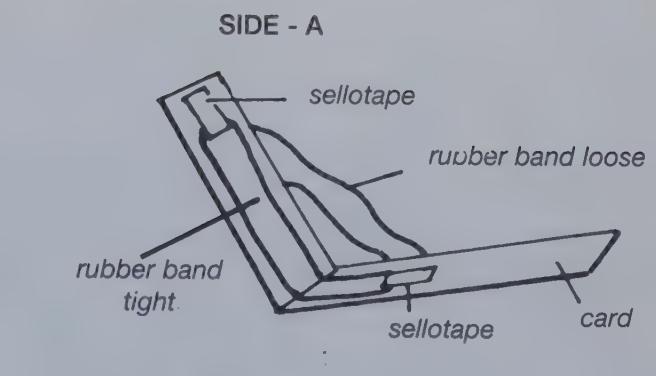
Muscles usually work in pairs. When one muscle contracts (or gets shorter), the other muscle relaxes (or gets longer).



Muscles usually work in pairs

Make a model to see how two muscles work together : Take a strip of card about 20 cm long. Fold it in half, but do not bend it the other way. Stick a slightly stretched rubber band to the inner side of the card. Use sellotape and stick one end about 5 cm from the fold, and the other end about 15 cm from the fold as shown in the diagram on page 45. Turn the card over and stick a rubber band on the outer side. It should be in the same position, but a little less stretched than the other band.

When the card is bent, the inner rubber band is loose, the outer one is tight. If you straighten the card, the inner rubber band is tight and the outer one loose. If you pull the inner rubber band, you can bend your cardboard arm. If you pull the outer rubber band, you can straighten it.



The rubber bands are rather like your muscles because they work in pairs. The difference between your model and a real arm is that when you bend your arm, the muscle inside your elbow contracts. When you straighten your elbow, the muscle outside your elbow contracts.

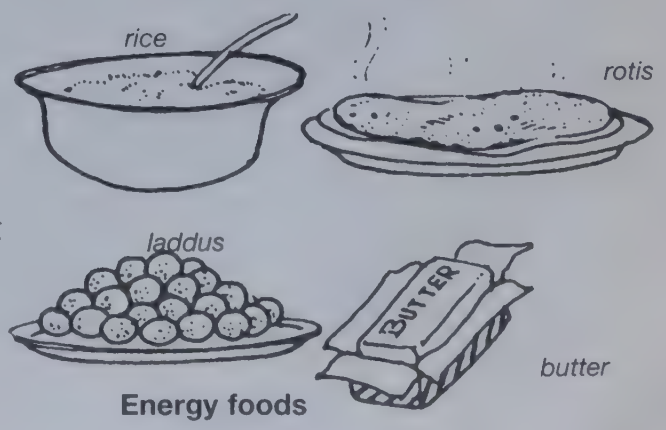
How to have strong muscles

If you want your muscles to be strong, you must do these things.

* Exercise regularly.
* Eat food containing protein (e.g. milk, eggs, nuts, dal, meat and fish).
* Make sure that your posture is good (that your back is straight).

Answer these questions :

1. Name two muscles which you can control.
2. Name two muscles which you cannot control.
3. When you bend your arm, does the muscle inside your elbow get longer or shorter?
4. What happens to the muscle outside your elbow when you bend your arm?
5. What kind of food is good for bones?
6. What kind of food is good for muscles?
7. Which is better for your bones and muscles — a straight back or a bent back?
8. Kalpana goes to school by car and sits on a bench at playtime. Sheela walks to school and plays kabbadi or hopping games at playtime. Which girl do you think has stronger bones and muscles?



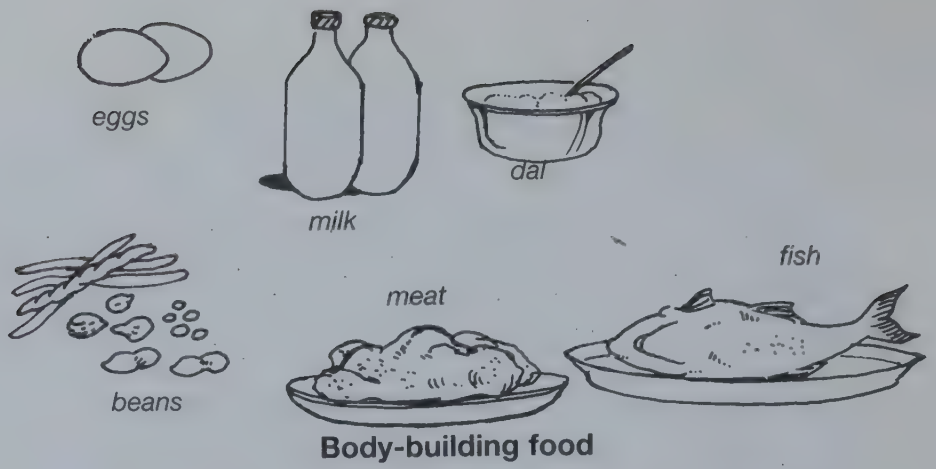
Energy foods

D. Malnutrition

In Book 4 you learnt that it is very important to eat a *balanced diet*. Every day we should eat :

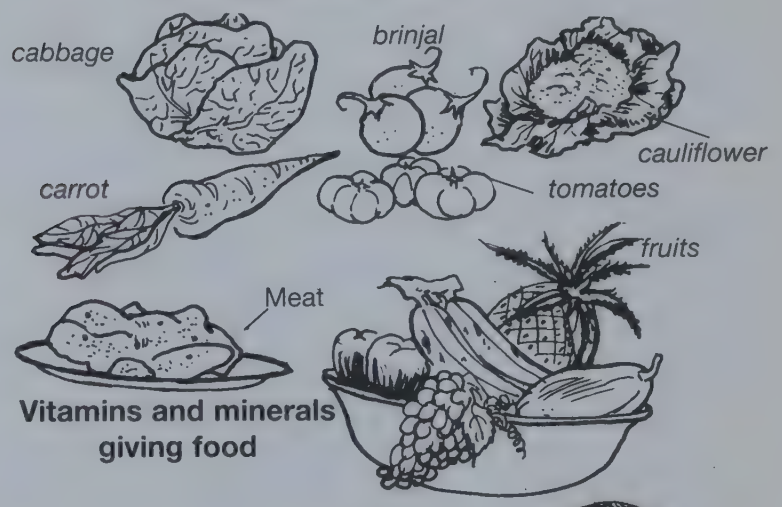
1. *energy food* (starch, sugar and fat)

2. *body-building* food (protein



Body-building food

3. food which protects us against disease
(vitamins and minerals)

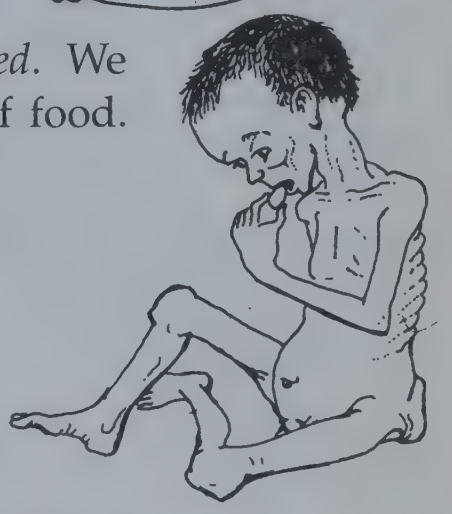


Vitamins and minerals giving food

If we don't have a balanced diet, we become *malnourished*. We become ill because we do not eat enough of the right kinds of food. Children especially become ill if they are malnourished.

What happens to children who don't eat enough of any food?

Severely malnourished children do not get enough of any food. They are very thin. Sometimes they have big stomachs because their stomachs fill with air. They get tired easily. They need to eat more of everything. They look like this :



This child should eat more of everything.

This child should eat more protein food.

What happens to children who don't eat enough protein?

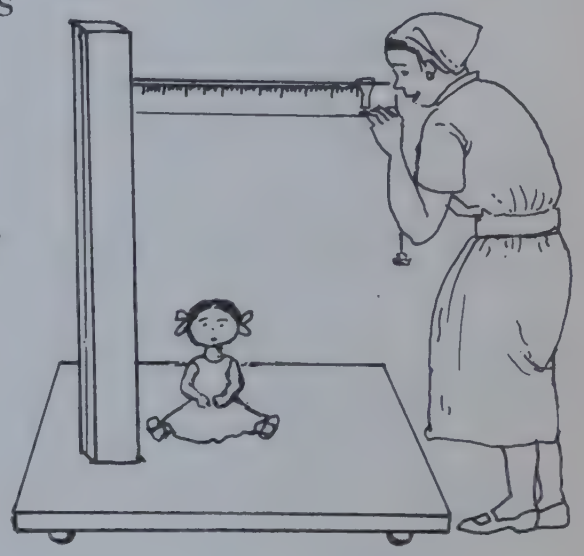
Some children have a lot of energy food like rice, but not enough protein. They grow very slowly. They get sores on their skin. Sometimes they have swollen hands and feet. Their hair is thin and light. Even though they may look fat, their upper arms are thin. If a child is older than one year, his/her upper arm should measure more than 14 cm around. If the arm is thinner than 14 cm, he/she is malnourished and must eat more of all kinds of food. If the arm is thinner than 13 cm, the child is badly malnourished.

Write down eight signs of a malnourished child.

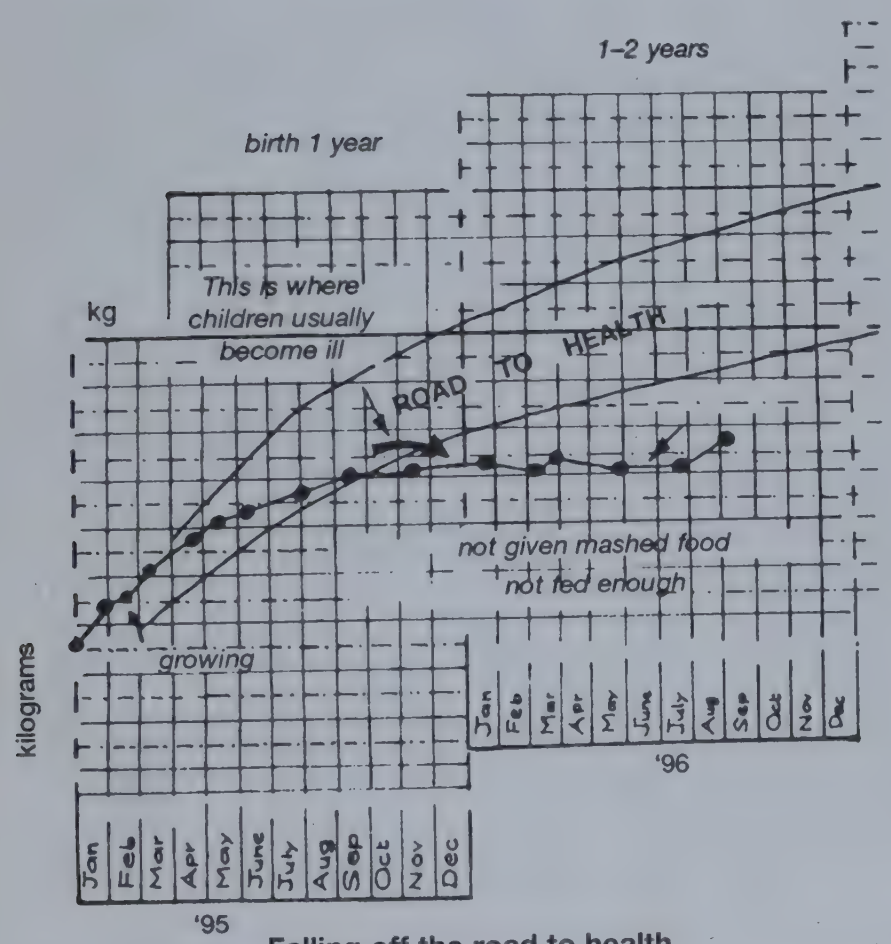
E. Lakshmi's weight graph

After babies are four to six months old, they can start to eat a little soft boiled vegetable, dal and rice. They can also have mashed fruits and eggs. The mother should continue feeding the baby with her milk at the same time. If possible, she should give the baby her own milk until he/she is at least one year old. Children often become malnourished when they are six to twelve months old. It is very important to give them food with starch, fat, protein, vitamins and minerals.

Malnourished children should eat at least four times a day so that they can build up their weight. If they eat a balanced diet, they should gain weight steadily. If they don't gain weight, there is something wrong.



Lakshmi is one year and nine months old. Her mother takes her to be weighed at a clinic every month or two. The graph below shows Lakshmi's weight from the time she was born. A healthy childs weight should be somewhere between the two thin black lines. The space between the lines is called the *road to health*.



Falling off the road to health

Lakshmi is malnourished. Her weight is not between the two black lines of the road to health. She was growing quite well until she was four months old. Then she grew more slowly. When she was nine months old, she stopped growing. Her mother did not give her mashed food until she was a year old. Even then, Lakshmi only ate twice a day. She usually only had rice and pickle. Her mother became worried about Lakshmi and bought expensive tonics and vitamins. But she did not give her eggs, dal, fruit or vegetables.

Now Lakshmi is often ill. She is ill because her body is weak. She cannot fight *infections*. So she gets even thinner. Her mother has to buy expensive medicines to make her better. She should give Lakshmi a balanced diet instead. It would be cheaper than tonics, vitamins and medicine — and much better for Lakshmi.

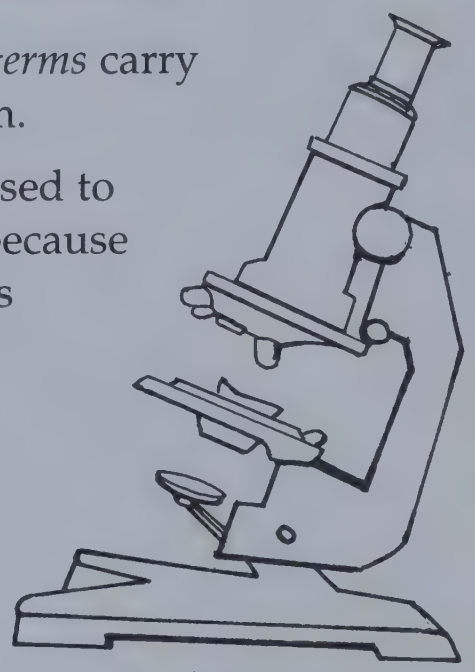
Did you know ?

Cool drinks like cola and fizzy orange rot your teeth. They don't contain protein or vitamins so they don't make you healthy. If you want a treat, have some fruit instead !

F. How to protect ourselves against disease

Even if we eat well, we may become ill. This is because *germs* carry disease. Most germs are so small that we cannot see them.

In the past (and in some villages even today) people used to believe that evil spirits or Gods caused disease. This is because they could not see the germs. We now know about germs because we can study them through *microscopes*.



A microscope

Germs can pass from one person to another and make them ill. Germs pass through the air, through food and through water. Germs in the air can give us colds, flu, measles, chicken pox or mumps. Germs in food and water can give us diarrhoea, cholera or typhoid. Germs in people's spit can give us tuberculosus (TB) and AIDS. Germs carried by mosquitoes can give us malaria. There are several ways of protecting ourselves against these diseases.

VACCINATIONS

Vaccinations are medicines which prevent us from getting diseases. They help our bodies to fight the disease. When babies are small, they should go to a doctor for their vaccinations. Some vaccinations are given by injection. The polio vaccination is usually taken by mouth.

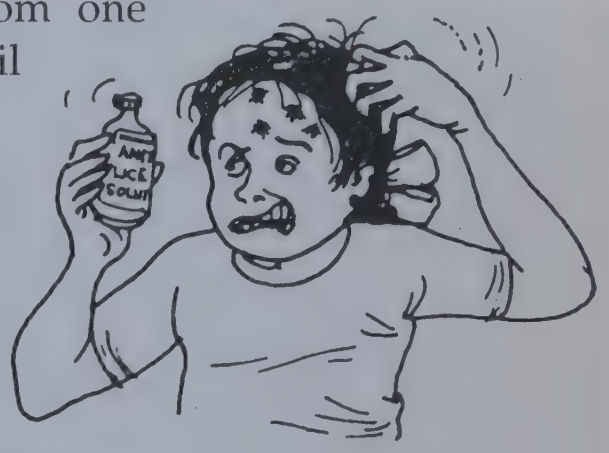
Babies and young children must be vaccinated several times to protect them against different

dangerous diseases. If there is a young child in your family, or some family you know, find out if she/he has been vaccinated. If not, ask your doctor when you should bring the child for vaccination. Keep strictly to the timings the doctor suggests.

At about your age (10 –12 years), you should have a *tetanus booster.* Ask your parents to check with your doctor when you need it.

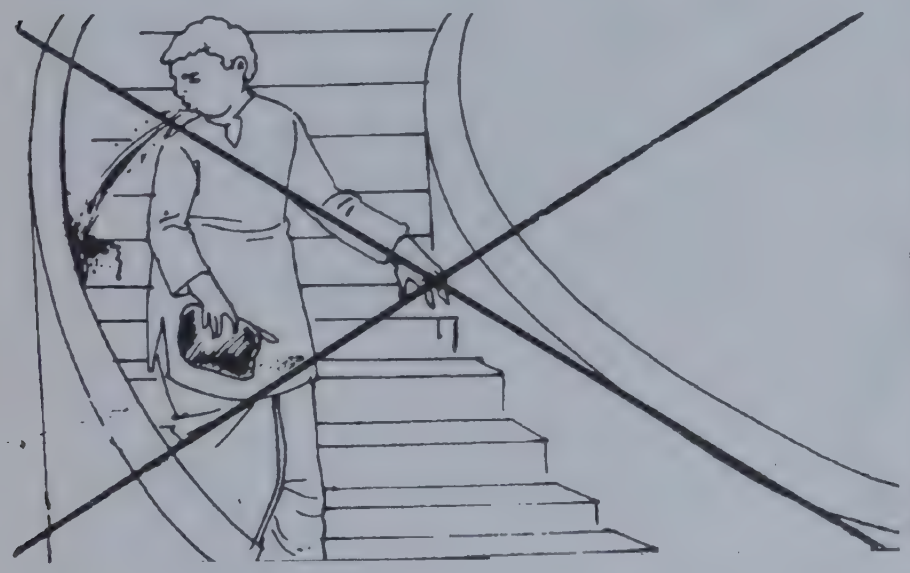
CLEANLINESS

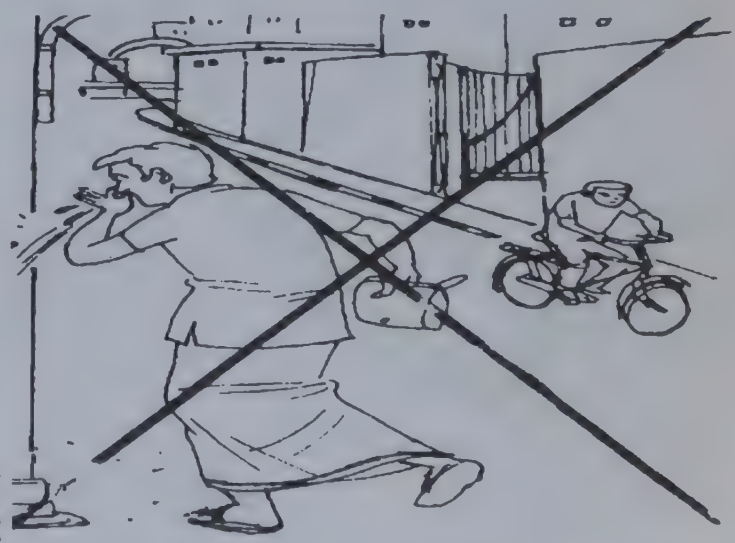
We have already learnt that we must keep our food, water and surroundings clean. Germs love dirt. Many dangerous diseases pass from one person to another in dirty food or water. If possible, boil or filter your drinking water. Wash your hands and vessels before you cook or eat. Do not eat old food which has gone bad.



If we don't keep our bodies and clothes clean, we get skin diseases. So make sure that you have a bath every day. If you get lice in your hair, your whole family should have a head bath with anti-lice shampoo. A mixture of kerosene and coconut oil also kills lice.

We should never spit or blow our noses onto the street because if we have a disease, we may give it to other people. TB is a dangerous disease which is carried by spit. AIDS is another very dangerous disease which is carried in the blood, spit and other body





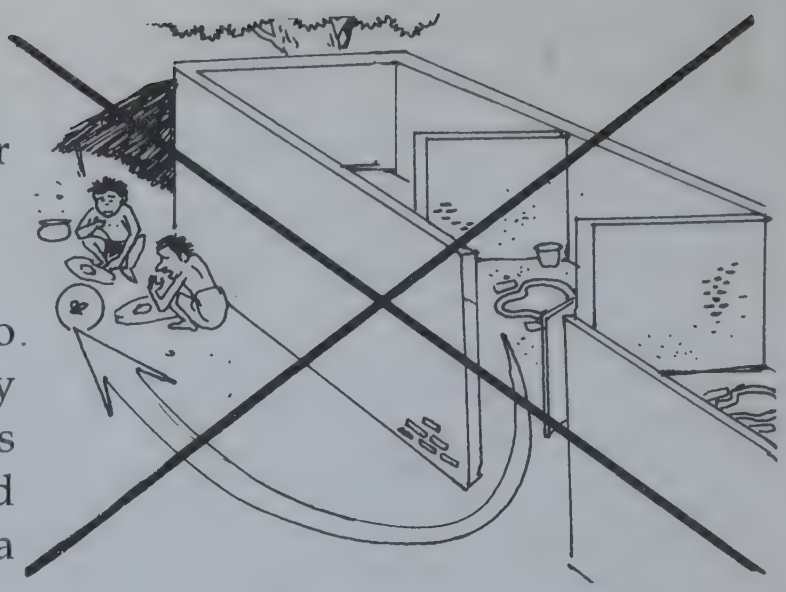
fluids. Don't touch other people's blood or spit, especially when you have a cut. If you do, wash the blood or spit off immediately with soap.

Some diseases like AIDS are carried by dirty injection needles. NEVER use an injection needle which has been used by someone else.

KEEPING AWAY FROM INSECTS AND ANIMALS WHICH CARRY DISEASE

Some mosquitoes carry malaria. So try not to let them bite you! If possible, sleep under

a mosquito net. You can also keep mosquitoes away with skin creams and mosquito coils. Mosquitoes lay their eggs in still water, so cover water tanks and try not to let water collect anywhere outside your house.

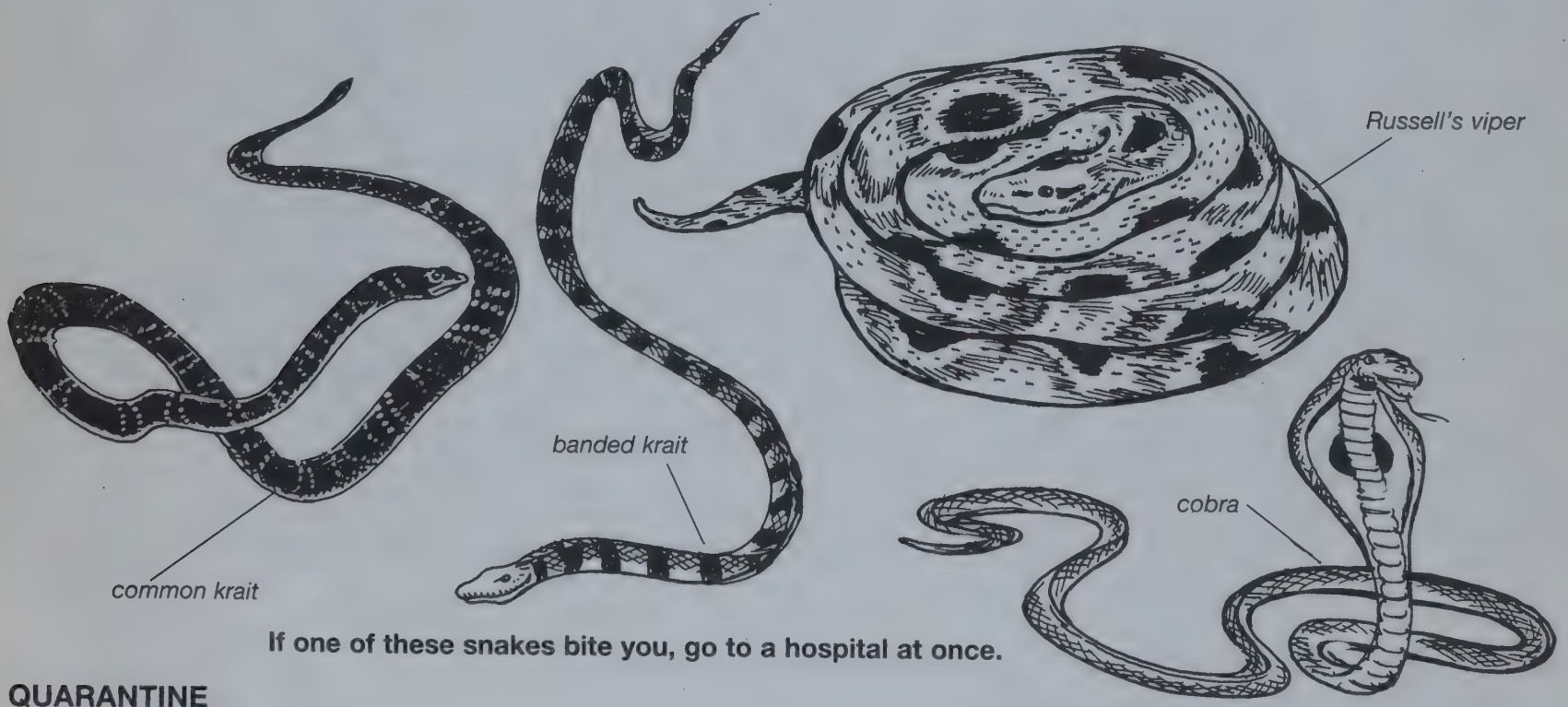


Flies and cockroaches like toilets. They also like food. So if they sit on your food, they may bring dirt on their legs from the toilet. Always cover up food and keep insects out of food cupboards. Don't eat or keep food open near a toilet or rubbish heap.

Rabies is a very dangerous disease which is carried by animals like dogs, cats and monkeys. If one of these animals bites you, you must go to the doctor AT ONCE for injections. If you don't, you may get rabies and you may even die.

KEEPING AWAY FROM DANGEROUS ANIMALS

In many places you must be careful of snakes. Not all snakes are dangerous. Three of the most dangerous snakes are the *cobra*, the *krait* and the *Russell's* viper. If one of these snakes bites you, you must go to a hospital AT ONCE for an injection. If you don't, you will die.



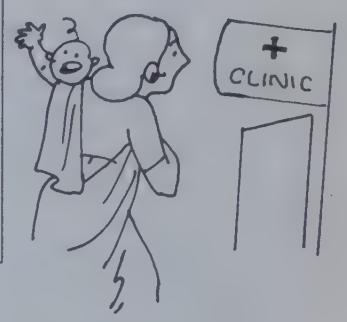
If one of these snakes bite you, go to a hospital at once.

QUARANTINE

Some diseases travel through the air. People with such diseases should stay away from other people until they are better. Germs can go into the air when they sneeze or cough and other people breathe them. If you have measles, chicken pox, mumps or flu, it is best to stay away from other people. Then you cannot give them your germs. When you keep away from other people, you are in *quarantine*.

Mrs Sengupta is telling her daughter how to look after her baby. She's rather bossy, but she's right ! What do you think she is saying ? Make sentences from the table below.

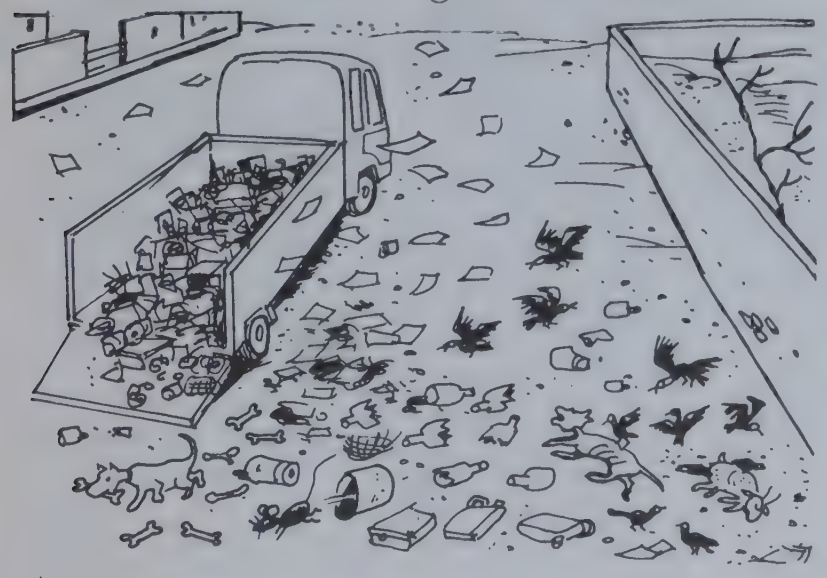
	boil the baby's drinking water.
	take the baby to the clinic for his vaccinations.
	spit your paan into the corner of the room.
	wash the baby's clothes every day.
	give the baby sweets from the street stall.
You must	keep the baby's food uncovered.
You mustn't	go for a mantra if a snake or dog bites the baby.
	go to the hospital if a snake or dog bites the baby.
	let him play with other children if he gets measles.
	make sure that he sleeps under a mosquito net.



G. Rubbish

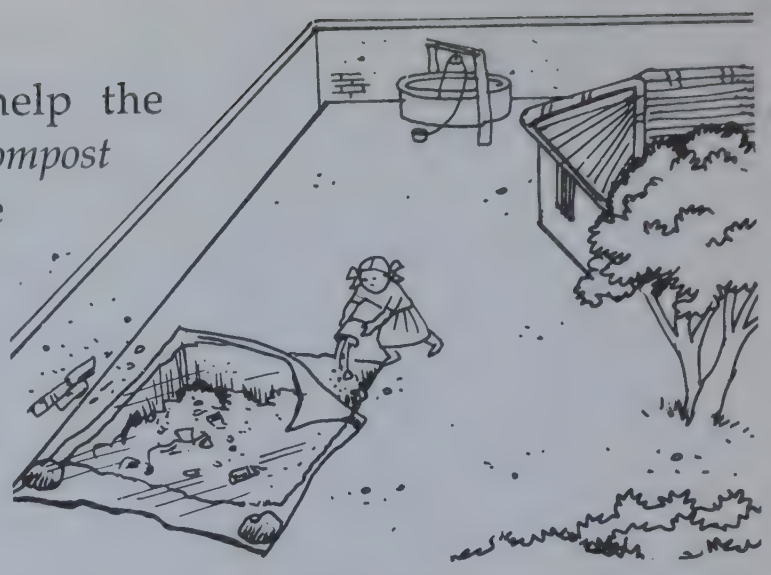
Rubbish in the streets is bad for all of us. It spreads diseases. The more things we get, the more rubbish we make. More and more people nowadays buy food in packages, tins and jars. Then they throw the rubbish away.

The rubbish often collects in dirty piles on the street before it is taken away. Then it is usually taken to rubbish dumps. Animals and insects visit the rubbish dumps and spread germs. Chemicals in the rubbish are washed into the soil by the rain. Then they get into the underground water and pollute our drinking water. If the rubbish is burned, the air is polluted too. If it is not burned, the rubbish smells bad. If we want to be healthy, we must do something about our rubbish.



Some kinds of rubbish are *biodegradable*. This means it will rot and mix with the soil. All food waste and paper is biodegradable. So is the dung of animals and humans. Other kinds of rubbish are *non-biodegradable*. They will not rot away. Plastic, metal and glass are not biodegradable. These two kinds of rubbish need different treatment.

Biodegradable rubbish can be used to help the environment. If you have a garden, make a *compost* heap for your food waste. Dig a pit and let the vegetable waste rot for several months. Cover it with an old sheet of plastic and weigh the corners down with stones. Then spread it on the soil. It will make the soil better. Animal dung can also be spread on the soil. Or it can be used to make gobar gas, as we learnt in Class 4.



Making a compost heap

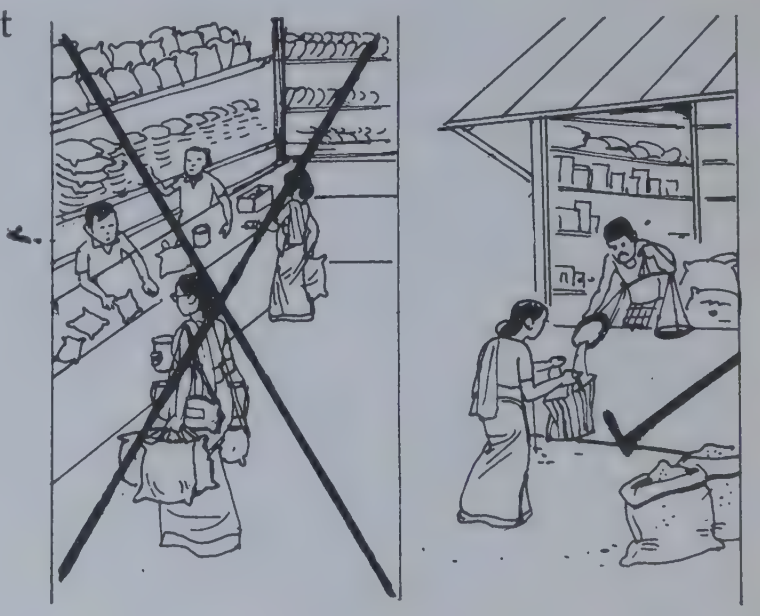
Recycling waste paper, tins and bottles

You can also sell old paper for *recycling*. Recycled paper is made of used paper. It is cut up, coloured white, and made into clean new sheets. This is good for the environment because if we recycle paper, we don't cut down so many trees. It also means that there is less rubbish.

A lot of non-biodegradable rubbish can be recycled too. Glass bottles and tins can be used again. Even broken bottles can be melted down to make new ones.

Aluminium cans can also be melted down and made again. Someone usually comes round the streets to collect these things, so sell them or give them away. Don't throw them away. Even if you don't want an old can, someone else may want it.

But there are some things which will not rot and which you cannot recycle. You have probably seen cracked plastic mugs lying at the side of the road. They have to go to the garbage dump. These dumps should be covered with earth often so that the rubbish does not smell or blow away.



It is sad that we cannot recycle all our rubbish. So the best we can do is to make as little rubbish as we can. Don't buy food in plastic bags or boxes. Have it weighed and

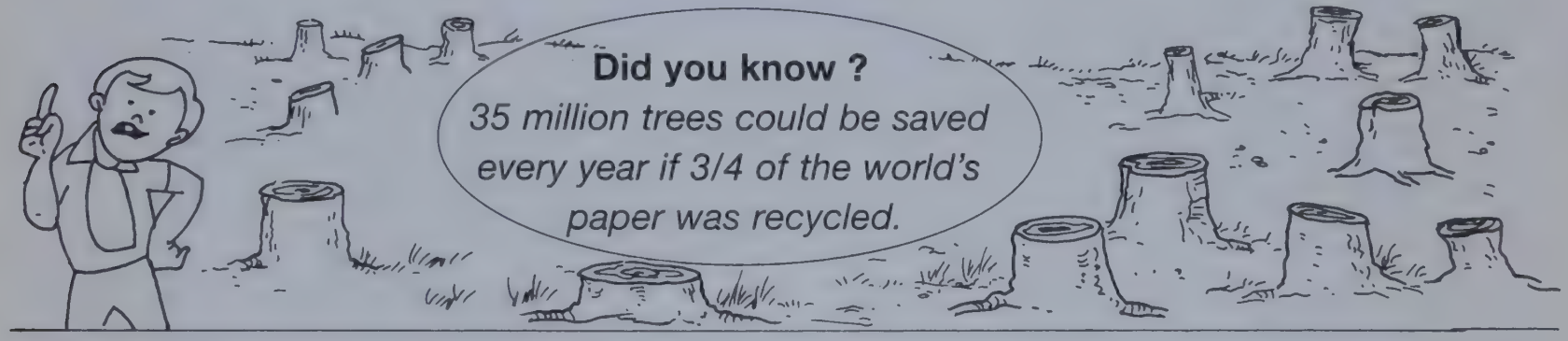
buy it loose. Don't take a plastic bag from the shop. Use a cloth bag of your own. Try not to waste anything. If something breaks, don't throw it away. Mend it and use it for as long as you can. If you can't mend it, give it to someone who can.

Re-use your bags. Don't waste packaging.

Write where these kinds of rubbish should go (if you cannot use them yourself). You may not all agree. Be ready to explain why you chose each column.

onion peelings	dead plants from your garden
old newspaper	metal can with a hole in the bottom
glass jam bottle	cracked plastic water bottle
plastic oil bottle	food which has gone bad

rubbish tip	*recycling*	*compost heap*



Revision

I. Choose the best ending for each sentence.

1. We keep fit if we
   a) do a lot of exercise and eat sweets every day.
   b) sweep the floor and go to the doctor every day.
   c) run all day and only eat in the evening.
   d) do plenty of exercise and eat a balanced diet.
2. There is no moving joint in
   a) the skull.
   b) the knee.
   c) the shoulder.
   d) the elbow.
3. The hip joint is
   a) a hinge joint.
   b) a ball and socket joint.
   c) a joint in your fingers.
   d) a joint which cannot move.

4. Muscles usually work
   a) without other muscles. b) in pairs.
   c) only at night. d) only in the day.
5. When the inner muscle in your elbow contracts, it
   a) digests you food. b) chews your food.
   c) bends your arm. d) straightens your arm.
6. If we want good posture, we should
   a) run a mile every day. b) swing our arms around in a circle.
   c) sit with bent backs. d) keep our backs straight.

II. Fill in the blanks.

1. Injections which prevent you from getting diseases are called ..... .
2. You can kill germs in drinking water by ..... it.
3. Mosquitoes carry ..... .
4. Body fluids carry ..... .
5. Dogs carry ..... .
6. Rubbish which will rot away is called ..... .
7. When you use old paper to make new paper, you ..... it.

III. Eating well: The food quiz

Divide your class into two or more teams for this food quiz. Read these rules first, then shut your books. Your teacher will ask the questions. Try to let each child in the team have a turn. Every time a member of a team gets a mark, the teacher will write it on the board. If one team cannot answer, the other team can try to answer it. If the second team get it right, they get an extra point. Add the points at the end to find the winning team.

Round 1 : *(2 marks for each answer: 1 mark for each correct food mentioned)*
Name two foods which contain : (i) fat, (ii) protein, (iii) starch, (iv) vitamin A, (v) vitamin C, (vi) calcium, (vii) iron, (viii) sugar.

Round 2 : *(1 mark for each correct answer)*
What food : (i) protect us from disease? (ii) give us energy? (iii) make us grow well?
Name one kind of food which we can keep by :
(iv) fermenting, (v) drying, (vi) pickling, (vii) boiling, (viii) keeping cool.

Round 3 : *(1 mark for each correct answer)*
Say whether these habits are good or bad for your health:
(i) smoking cigarettes or bidis (ii) chewing paan (iii) eating sprouted gram (iv) drinking alcohol (v) eating a lot of oily food (vi) eating a lot of fruit (vii) eating brown rice (viii) eating a lot of sweets.

Extension work

1. Write a letter to your local municipal council. Ask :
   a) how often the rubbish is collected.
   b) where it is taken to.
   c) whether it is burned, covered with earth or just left in a rubbish dump.
2. Collect pictures of children suffering from malnutrition in various countries in the world. In groups make charts and posters and pin them on your classroom display board.
3. Make a list of things that you can do to keep yourself fit and healthy.

Answers for the food quiz :

Round 1 : Many possible answers for these. Accept any reasonable answers. Further information can be found in Unit IV of Book 4. Two examples are given: (i) ghee, fried foods (ii) milk, meat (iii) rotis, rice (iv) carrots, mangoes (v) limes (and most sour fruit), green vegetables
(vi) milk, eggs (vii) green, leafy vegetables, meat (viii) sweets, ice-cream

Round 2 : (i) vitamins and minerals (ii) sweets, fats and starch (or carbohydrates) (iii) proteins; (iv) milk/curd (v) papads (vi) mangoes
(vii) dal or soup (viii) any food which can be kept in a fridge

Round 3 : (i) bad (ii) bad (iii) good (iv) bad (v) bad (vi) good (vii) good (viii) bad

UNIT 5

Air

Key words

inflate : to fill with air e.g. *When you blow air into a balloon, you inflate it.*
pressure : push e.g. *When you pump up a cycle tyre, you increase the air pressure.*
steamlined : slim and smooth e.g. *A streamlined shape moves fast because air can flow over it easily.*
variables : changed conditions for an experiment e.g. *If you want to give children a fair exam, the variables should be the same; they should all have the same amount of time; the same questions etc.*
ventilate : to make air go through or into e.g. *She opened the windows to ventilate the house.*

A. What you know about air

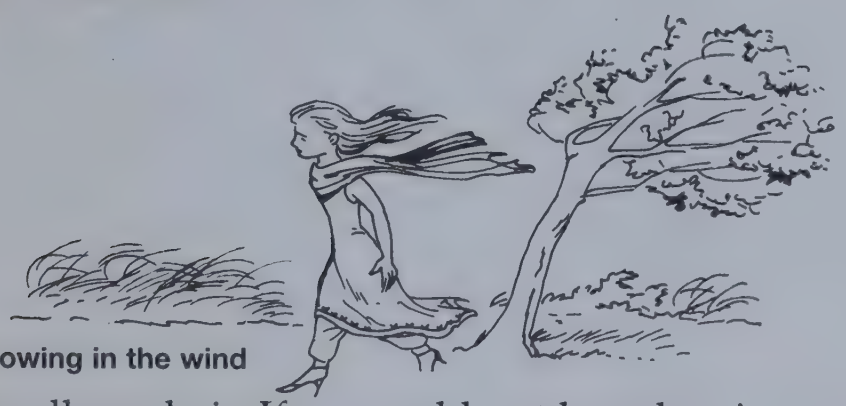
For the teacher :

Please do the experiments before the lesson in this unit.

You will need (if you wish to redo the experiments which were done in class 3) :

* a bucket of water, a glass, a piece of paper, an old postcard, a candle, matches.

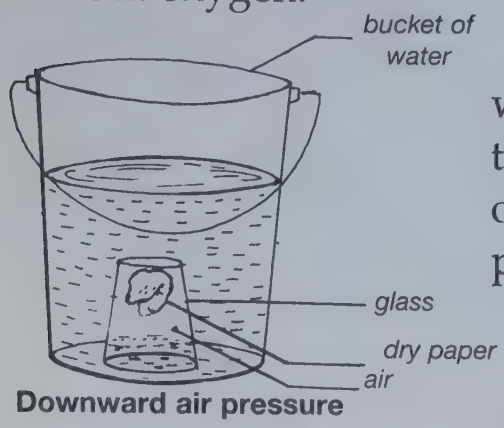
In class 3, you learnt about air. In this lesson, we will revise what we learnt then and learn some more.



Blowing in the wind

We cannot see air, but we can feel it moving when the wind blows against our faces.

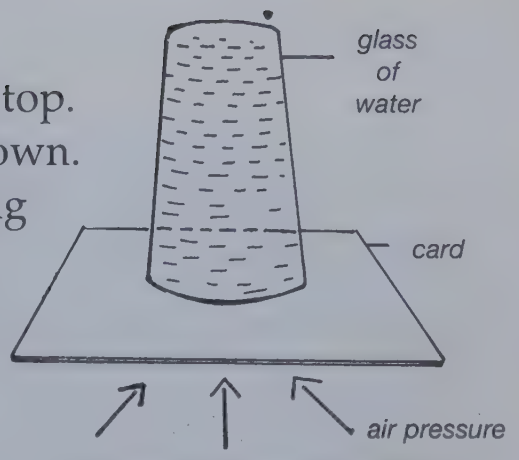
We all need air. If we could not breathe air, we would die. We learnt that there are different gases in the air like water vapour, oxygen, carbon dioxide and nitrogen. About 20 per cent (or one-fifth) of the air is oxygen. All living things would die without oxygen.



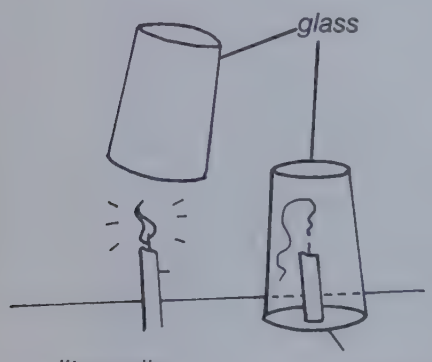
Downward air pressure

Air takes up space, even though we cannot see it. In Class 3 we put a crumpled piece of paper in a glass. Then we put the glass upside-down in a bucket of water. When we took out the glass, the paper was dry. The water did not get to the paper because the glass was already full of air.

Air has pressure. We filled a glass with water right to the top. Then we put a postcard on it and turned the glass upside down. The water did not fall out because the air below was pressing up on the card. There was no air inside the glass to press it down.



Air exerts upward pressure



Fire needs air

Fire needs air. When we put a glass over a burning candle, the flame went out because it burned up the oxygen in the glass and no more air could get in.

Air can be polluted. Smoke from factories and exhaust from cars pollute the air. They cause acid rain and the greenhouse effect. They also give people asthma and lung diseases.

Find at least ten words connected with air in this word search. The words may go sideways, down or diagonally. One is done for you.

D	W	M	O	H	A	N	W	I	O	M	A	L
C	A	R	B	O	N	D	I	O	X	I	D	E
N	T	C	V	R	N	I	N	B	Y	H	R	T
A	E	W	I	X	E	L	D	H	G	A	S	N
L	R	U	B	D	E	A	R	R	E	K	I	M
O	V	Z	S	T	R	U	T	D	N	E	U	R
P	A	R	A	C	P	A	V	H	U	S	M	R
Q	P	S	R	Q	Z	R	I	F	E	V	A	E
P	O	L	L	U	T	I	O	N	D	A	T	W
M	U	E	Z	B	Z	V	X	S	M	O	K	E
P	R	E	S	S	U	R	E	J	Q	E	Y	C

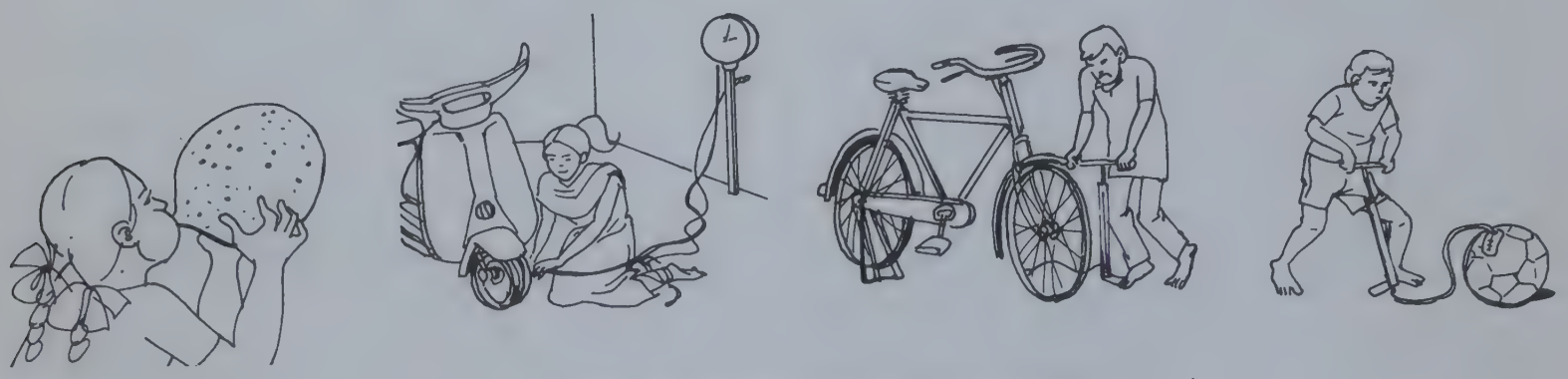
B. Air can inflate things

You will need:

* as many balloons as possible (at least six). Blow them up once and let them down before the experiment so that they are easy to inflate. All the balloons should be new.

When you blow air into a balloon, you make it bigger — you *inflate* it.

These people in the picture are all inflating things with air.



These people are inflating things with air

Do an experiment to see who has the biggest lungs: Give six children a balloon each. Get each child to take one big breath and blow into his/her balloon.

Which balloon is the biggest? Make sure that you do a *fair test*. You want to see who has the biggest lungs, so it would not be fair if one person blows air into the balloon before the experiment. When you do an experiment to find one thing, you should make sure that all the other *variables* are the same. Talk about the variables before you do the experiment.

How did you make sure that you did a fair test? Look at the list below. Write down only the variables which could change your result. Write down any other variables which might change the result.

All the balloons should be of the same colour.
All the balloons should be completely flat of before you inflate them.
All the balloons should be of the same size.
No one should sneeze after the experiment.
No one should take more than one breath.
Everyone should stand (and not bend over or sit).
Everyone should have short hair.

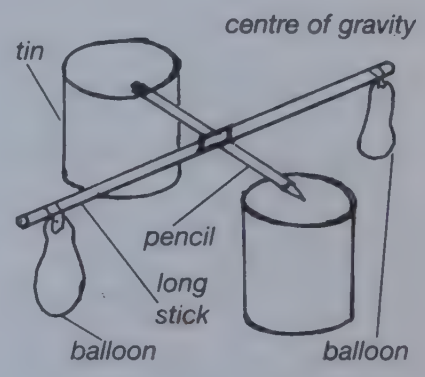
C. Weighing air

You will need:

* a long straight stick (at least 30 cm long), two tins, piles of books or jars of equal height, a long pencil, sellotape, two identical balloons.

In this lesson, we are going the find out whether air has weight. Set up the experiment as shown in the diagram.

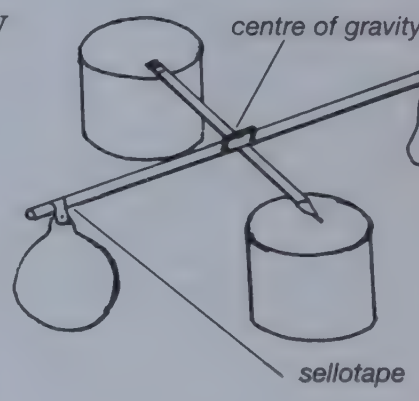
- Balance your stick on the pencil and mark the centre of gravity where it rests on the pencil. You may also stick it to the centre with sellotape. Rest each end of the pencil on two large tins or piles of books of equal height.



- Use a piece of sellotape to stick a balloon on each end of the stick. Check that the balloons balance each other. If they don't, move one of the balloons until the stick is level. Make sure that the balloons do not touch the table. If they do, put a thick book under each tin.

- Take off one of the balloons and blow it up.

- Stick it back in the same place. Check that the stick balances on the centre of gravity mark as it rests on the pencil. What happens?



How do you know if the balloons are still of the same weight?

Write what you did in your experiment under the following headings:

- Materials
- What we did
- The result
- What we learned

Use the past tense in paragraphs 2 and 3. Example: *We balanced our stick on the pencil and marked ...*

Did you know?

The air in a large room weighs about the same as a person (70 kg).

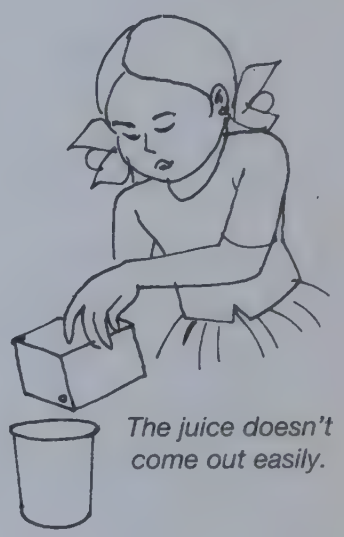
D. Air needs space

You will need:

* a small carton of fruit juice, a glass a pin.

We are now going to find out whether air fills spaces which look empty.

Take a carton of fruit juice. Make a fairly big hole on the top with a pin. Try to pour the juice into the glass.



The juice doesn't come out easily.

The juice comes out easily.

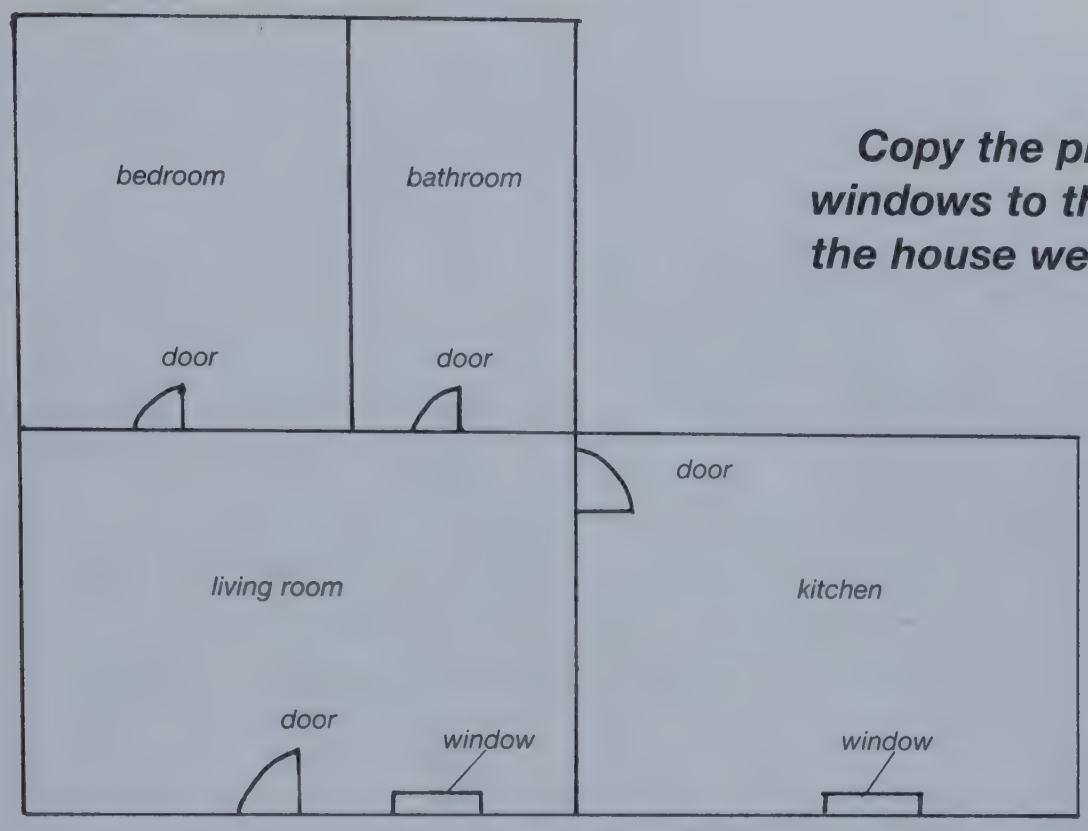
Now make another hole on the top of the carton. Again, try to pour the juice into the glass.

You probably found that when you made one hole, very little juice came out. This is because the juice blocked up the hole so that no more air could get in. The juice cannot come out until more air can get in to take its place.

When you made two holes, you probably saw drops of fruit juice coming out faster. This is because more air could get into the carton from the second hole. It took the place of the juice, so the juice could come out.

We need to remember this experiment when we ventilate houses that we are building. Well-ventilated houses have a lot of fresh air. We all need to breathe fresh air if we want to be healthy. If we have windows on opposite sides of the house, the air will flow through the house easily from one window or door to another. If we have windows on only one side of the house, fresh air will not come in easily because it has nowhere to go. So the air in the house will soon get hot and stuffy.

Here is a plan of a badly designed house. It is hot and stuffy.



Copy the plan, but add more windows to the design to make the house well - ventilated.

Plan of a house

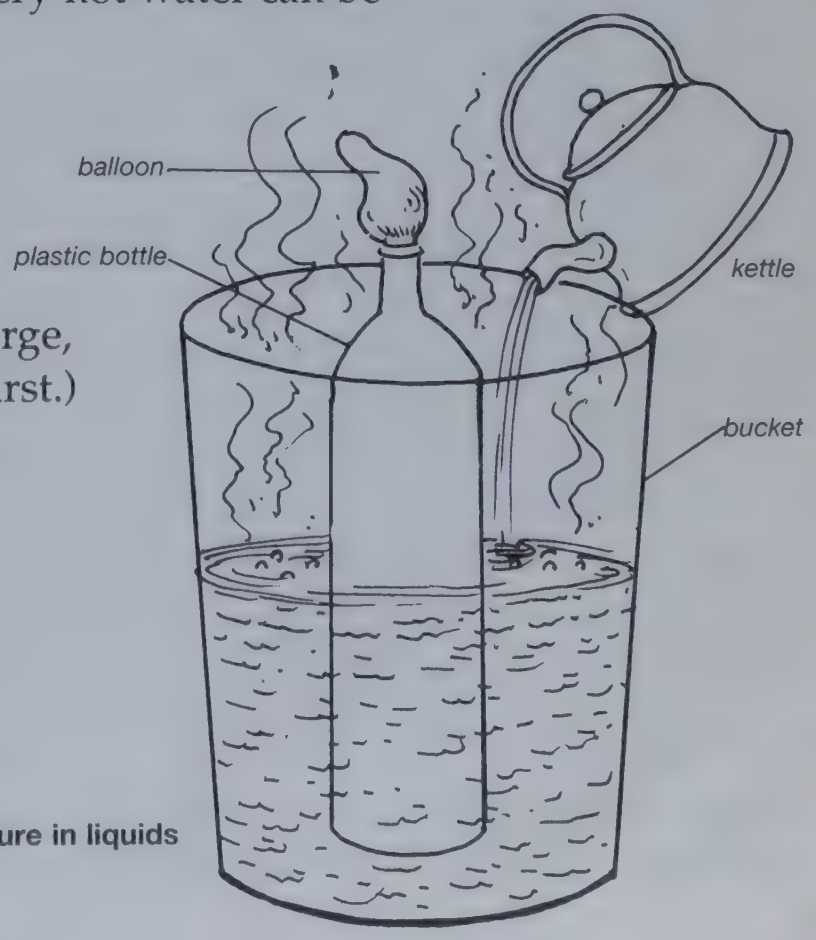
E. Hot air

You will need:

* a balloon, a large plastic bottle, a bucket, a kettle of very hot water.

In this lesson, we are going to find out what happens to air when it gets hotter. Your teacher will do most of this experiment as very hot water can be dangerous.

Set up the experiment like this :



1. Fix an empty balloon onto the neck of a large, empty plastic bottle. (Stretch the balloon first.)

2. Half fill a bucket with very hot water.

3. Put the bottle in the hot water.

4. Watch the balloon for a few minutes.

Air pressure in liquids

You probably found that the balloon got bigger. This is because hot air expands (or takes up more space than before). When the bottle was put in hot water, the air inside it expanded. It needed more space so it went into the balloon and inflated it.

Hot air is lighter than cool air, so it rises. Remember the convection spiral you made in Class 4. If you put a spiral of paper over a candle, it turns because the hot air from the candle rises and pushes the spiral around.

Choose the best ending for each sentence below.

1. The plastic bottle was full of *water/air/nothing.*
2. A balloon was attached to the *top of the bottle/the spout of the kettle/ the top of the bucket.*
3. The bucket was filled with *air/warm water/hot water.*
4. When the bottle was put in the water, the air inside it *disappeared/expanded/contracted.*
5. The air in the bottle expanded because it got *wet/colder/hotter.*
6. The hot air *inflated the balloon/did not inflate the balloon/deflated the balloon.*

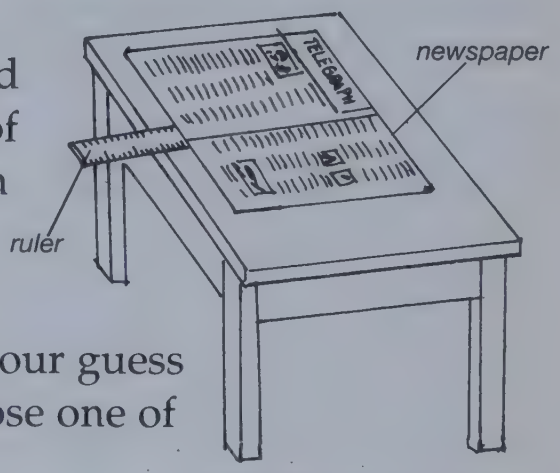
F. The strength of air pressure

You will need (for each pair of children) :

* a whole sheet of newspaper, a 30 cm ruler, a desk or table.

In this lesson, we will find out how strong air pressure is. You learned about air pressure when you did the experiment with the glass of water and the postcard. Air pressure held the postcard up under the glass of water.

Put a ruler on your desk or table so that about one - third of it sticks out over the edge. Cover the other two thirds of the ruler with a large sheet of newspaper. Smooth it down with your hands.



Strength of air pressure

If you hit the end of the ruler which sticks out over the edge of the desk, what do you think will happen? Write your guess in your exercise book before you do the experiment. Choose one of these or write your own guess:

The newspaper will fly into the air *The newspaper will tear* *The newspaper will not move* *The ruler will break*	*if I hit the end of the ruler.*

Now hit the end of the ruler.

Write what happened. Try to explain it. Also draw a diagram of the way you set up the experiment. (Think of how air presses on everything.)

G. Air pressure can move liquids

You will need (for each pupil) :

* a glass of drinking water, a straw, a pin.

In this lesson we will look at ways air pressure can move liquids. Put a straw in a glass of water. Then block the top of the straw with a finger. Lift the straw out of the glass. Find out whether the water comes out of the bottom of the straw. Then see what happens if you take your finger off the top of the straw.

Probably the water stayed in the straw when your finger was blocking air from the top. This is because air was pressing up on the water from the bottom, but was not pressing down from the top. When you took your finger away, air pressed down from the top and the water could fall out.

Suck some water up through the straw. You are sucking air out of the top of the straw, so the water has to come up and take its place. This is how you move water upwards. Blow bubbles through the straw into the water. The air from your mouth has pushed the water back in to the glass.

Now make a small hole with a pin about 4 cm from the top of the straw. Suck the straw again. Talk about your results in class. Is it easier or less easy to suck water now? What comes into your mouth with the water?

You probably found that it was more difficult to suck up the water when there was a hole near the top of the straw. This is because air was pushing down on the water as it came up the straw. You probably sucked some of this air into your mouth.

Which of these sentences are true?

You can lift water with a straw if both ends of the straw are open.

You can lift water with a straw if you close the top end of the straw.

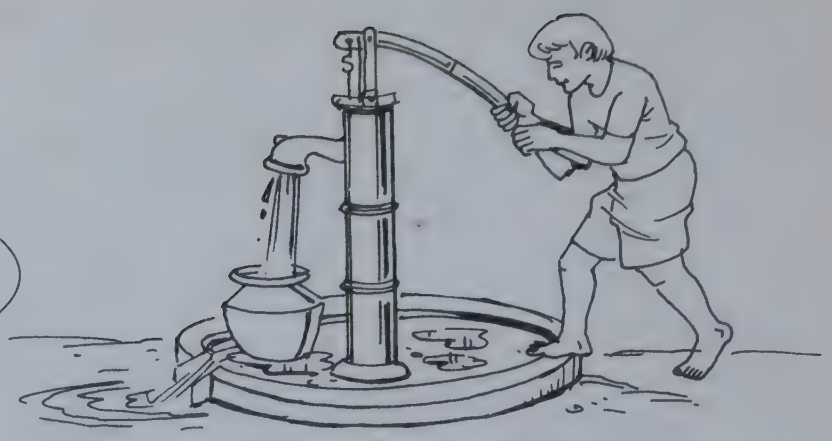
You cannot push air through a straw into water.

You can lift water into your mouth if you suck the top end of a straw.

It is more difficult to lift water into your mouth if you make a hole in the straw.

Did you know?

A bore pump lifts water from under the ground using air pressure.



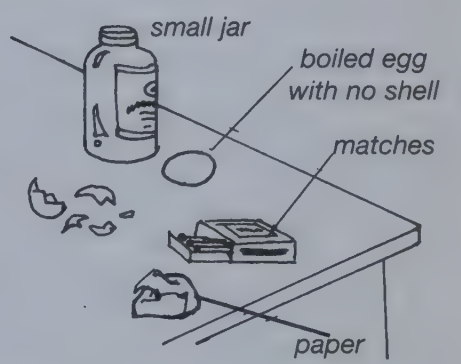
Hand pump

H. Air pressure can move solids

You will need :

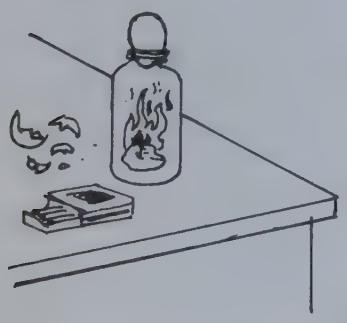
* a hard-boiled egg without the shell, a glass jar with a neck slightly narrower than the width of the egg (e.g. a small pickle or jam jar); the egg must not fall through if you put it on the open neck of the jar,
* matches, a crumpled piece of paper.

Put a piece of paper or book over the bottom half of this page. Don't look at it!



Set up the experiment as shown in the diagram. First talk to your classmates about what you think will happen. Your task is to get the hard boiled egg into the jar. How do you think you can do this? You are not allowed to cut the egg into pieces.

Perhaps some of you had bright ideas. Perhaps some of you secretly looked at the diagram below! It shows one way of getting the egg into the jar.



1. Light a corner of the paper with a match.
2. Drop the burning paper into the jar and immediately cover the top with the peeled egg.
3. Watch the egg.

The egg was probably sucked with a pop into the jar. Or at least it was sucked half way through the opening. If not, try the experiment again with two pieces of burning paper. Make sure that you put the egg on the opening of the jar AT ONCE before the paper stops burning.

You have already learnt that fire needs oxygen. The burning paper used up the oxygen in the jar, so there was less air pressure inside. The air pressure outside the jar pushed the egg inside.

Try this trick when you get home. You will amaze your family!

Draw the diagram of the egg in the mouth of the jar. Draw another diagram to show what happened next. Write a sentence or two to explain what happened.

I. Moving air

You will need (for each pupil) :

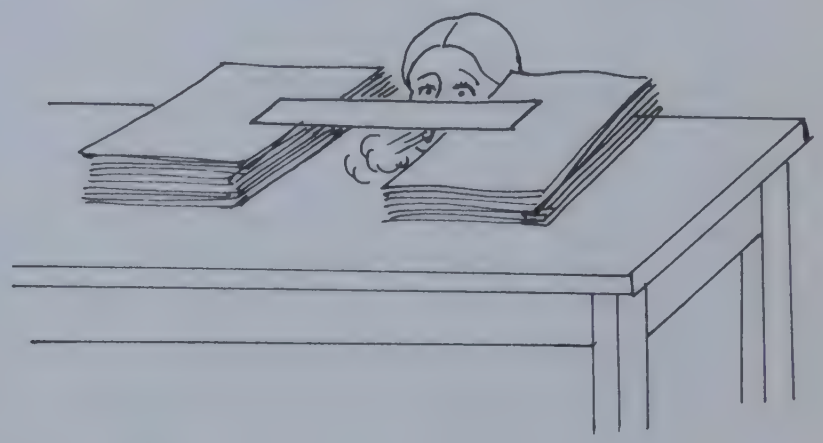
* two pieces of paper, some books.

In this lesson we will find out about how air changes in moving air.

Look at these two pictures. The girl is going to blow between the two pieces of paper in Picture A. She is going to blow under the paper in picture B.

A

B



Write what you think will happen. Don`t read ahead or you will spoil the fun and not learn for yourself. Your experiment might turn out differently too! Choose one of these sentences or write your own idea.

Picture A

The papers will blow apart.
The papers will come together.
The papers will flutter in all directions.

Picture B

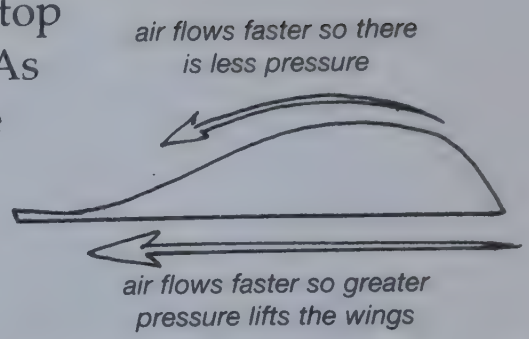
The paper will blow upwards.
The paper will blow away from the girl.
The paper will come down towards the table.

Do the experiment yourselves.

You probably found that in experiment A, the papers came together. This is because moving air has less pressure than still air. You made the air between the papers move, so the pressure of the air on each side of them pushed the papers towards each other.

The same thing should have happened in experiment B. When you blew under the paper, there was less air pressure below the paper. So it came down towards the table.

The inventors of aeroplanes used this idea to make planes fly. They invented wings which are curved on top. Because the top of the wing is curved, the air has to go faster to get over it. As the air under the wing is moving more slowly, there is more air pressure under the wing. So the plane rises up into the air. This is how aeroplanes take off. Their wings are shaped as shown in the figure.



In your own words write about the two experiments you did. For each experiments, use these headings:

1. Materials 2. What we did 3. The result.

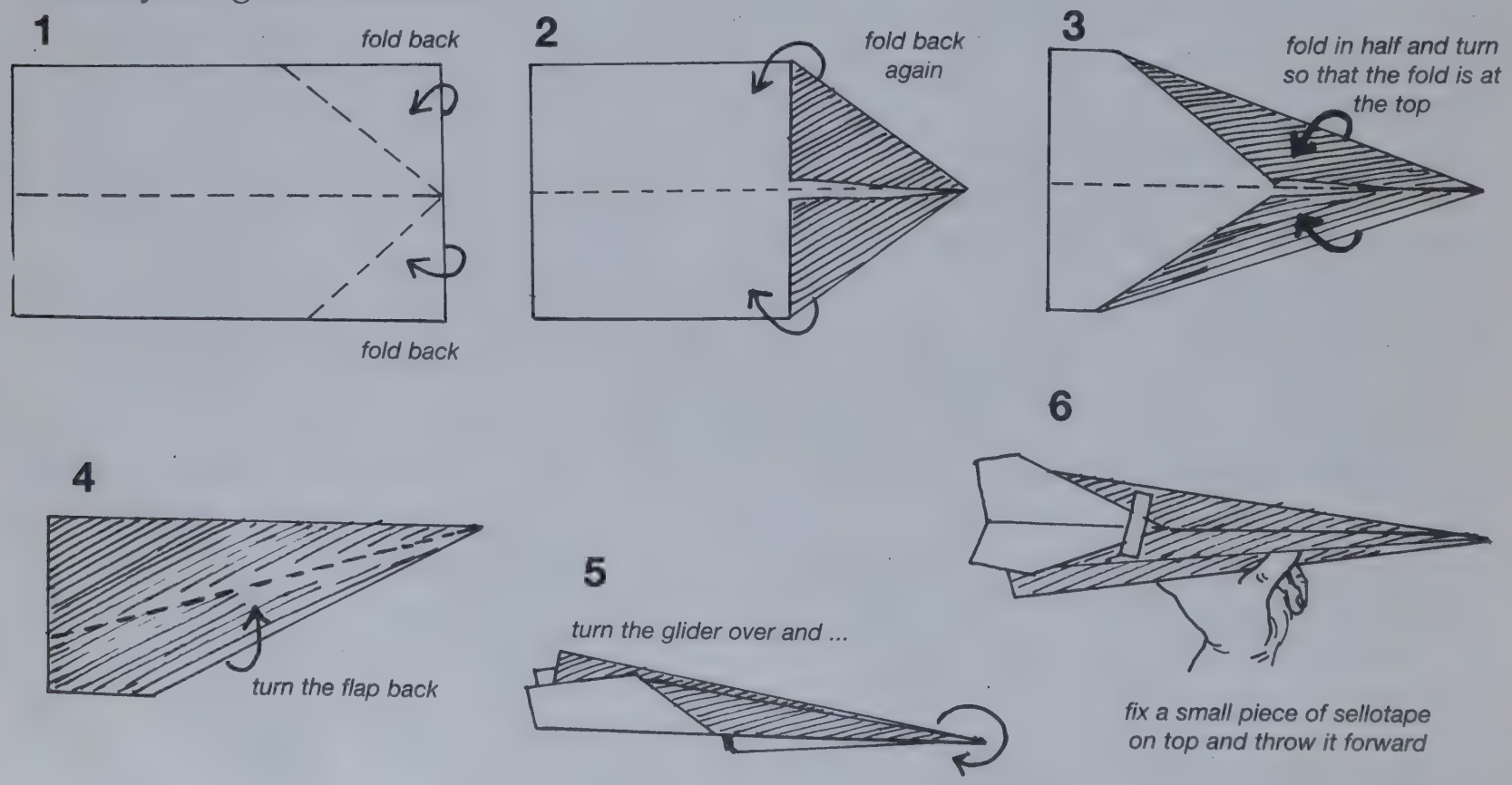
J. Streamlined shapes

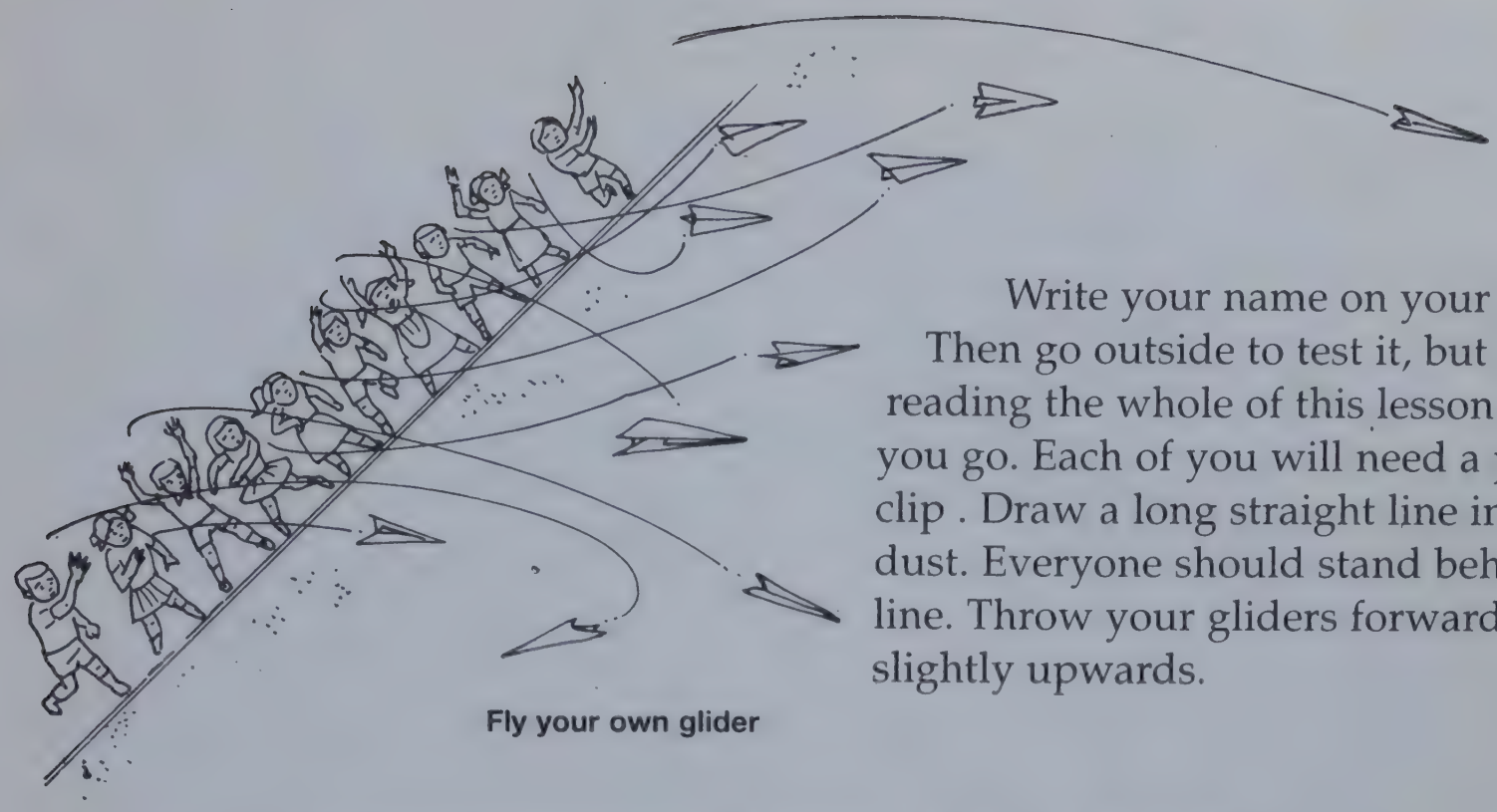
You will need (for each pupil) :

* a rectangular piece of fairly thick paper, a small piece of sellotape, a paper clip, a balloon.

In this lesson, each of you is going to make a paper glider. Then you are going to do a test to see who has made the best glider. The best glider is the one which goes the farthest. Remember that all planes must be *streamlined*. A streamlined shape can move easily through the air. It is usually smooth and pointed at the front so that air can flow over it quickly. So it is important that you make your glider carefully and fold down the edges with your nail. If bits of paper stick out, the air will hold the glider back.

Make your glider like this :

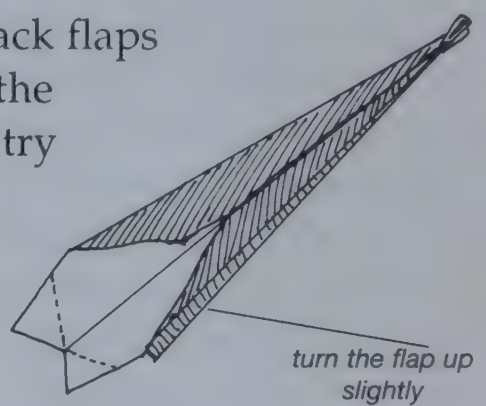




Fly your own glider

Write your name on your glider. Then go outside to test it, but finish reading the whole of this lesson before you go. Each of you will need a paper clip . Draw a long straight line in the dust. Everyone should stand behind this line. Throw your gliders forwards and slightly upwards.

If your glider goes straight down, try turning up the back flaps slightly. If it turns to the right or left, turn up just one of the flaps. Experiment to see which flap needs to go up. Also try flying your glider with a paper clip at the front. Discuss how this makes a difference. Throw an inflated balloon forwards. Look to see whether it goes as far as the gliders. Discuss the reasons for your result.



Discuss why each plane flies in the way it does. Look at the best gliders. Look at the gliders which turn to the right or left. Look at the gliders which go straight down. Help each other to make your gliders better.

Answer these questions:

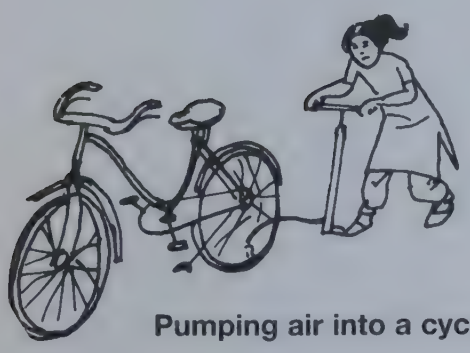
1. Which is more streamlined — a balloon or an aeroplane?
2. Why do streamlined shapes fly faster than fat shapes?
3. Whose gliders flew best?
4. What did you notice about the best gliders?
5. How did the glider fly if you turned up both back flaps?
6. How did the glider fly if you turned up the right hand back flap?
7. Which flew better — the glider without a paper clip or the glider with a paper clip? Why?

Note: Bring a clean handkerchief to your next science lesson.

K. Compressed air: making a parachute

You will need (for each pair of children) :

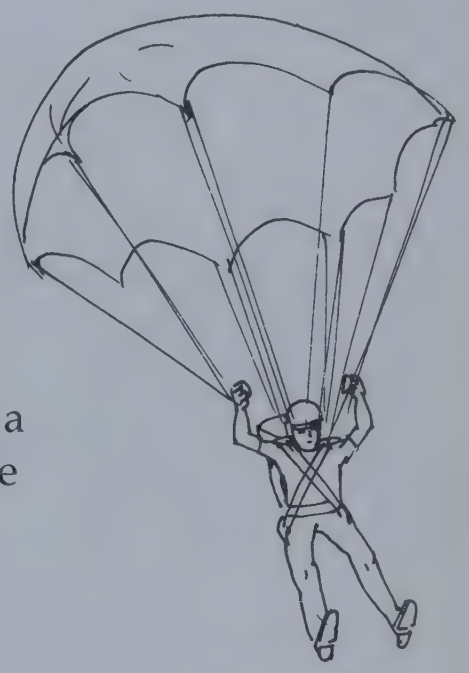
* a handkerchief (either large or small), four pieces of thread or light string (each 30 cm long), sellotape, a small, light object. (e.g. a pencil sharpener)



Pumping air into a cycle tyre

If you pump up a tyre, you fill it with air. As you go on pumping more and more air into the tube, the air gets squeezed or compressed. Compressed air is very strong. It can hold up the weight of a cycle, a car or a lorry.

Compressed air can also make things fall slowly. When a parachute falls, it squashes or compresses the air under the umbrella part. This does not stop the parachute from falling, but it makes it fall slowly. If you jump out of a plane with no parachute, you will be killed because you will hit the ground so fast. If you jump out of a plane with a parachute, the compressed air gives you a safe landing.



Moving air

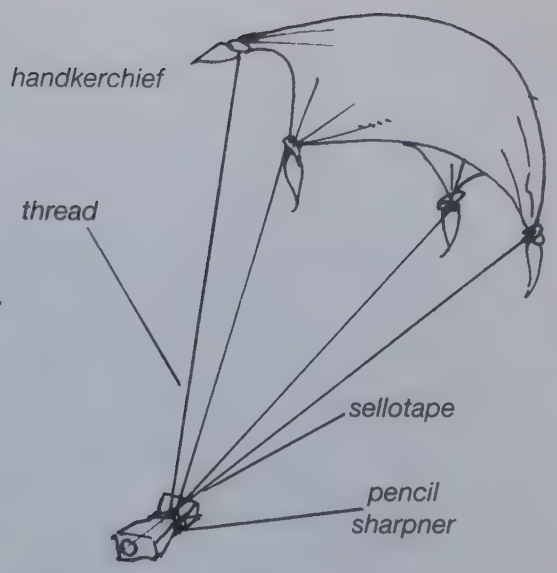
Make your own parachute.

1. Tie pieces of thread of equal length tightly to each corner of your handkerchief.
2. Lay the handkerchief flat and pull up the threads so that they are at the same level.
3. Sellotape them to your weight (e.g. a pencil sharpener or a rubber).
4. If possible, go to a high place where the class can drop their parachutes. A good place is a first floor balcony.
5. The best parachutes are the last to reach the ground.

Discuss in class what made the best parachutes.

If you have time, try doing these things:

1. Shorten the length of the threads.
2. Tie the thread further up the corners of the handkerchief.
3. Put a heavier object on the parachute (e.g. a big stone).
4. Put a lighter object on the parachute (e.g. a leaf).



Complete this table about the variables in your experiment by matching the two sides:

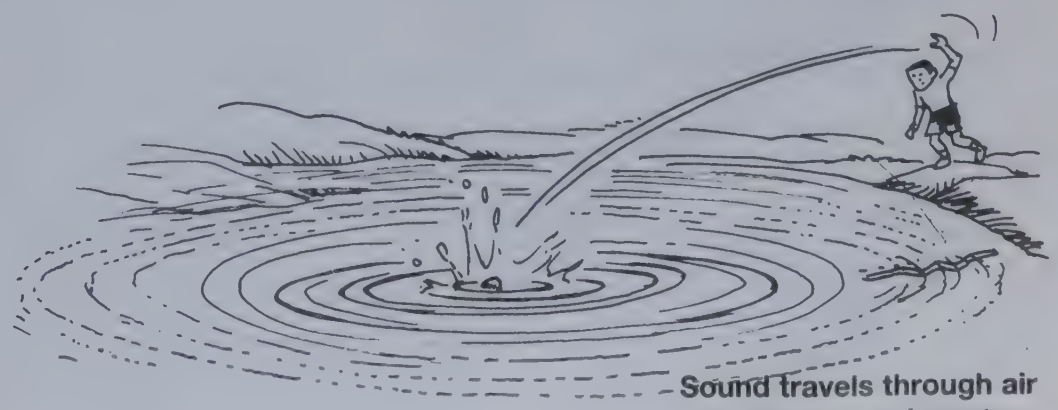
Variables	*Type of fall*
Small handkerchief	• fell fast because it was not heavy enough to pull down the corners of the handkerchief.
Big handkerchief	• fell fast because its weight was stronger than the compressed air.
Very light weight (e.g. leaf)	• fell slowly because it was big enough to compress a lot of air.
Medium weight	• fell fast because it was too small to compress much air.
Very heavy weight (e.g. stone)	• fell slowly because it was heavy enough to pull down the corners of the handkerchief, but not so heavy that it dragged down the parachute.

J. Air and sound

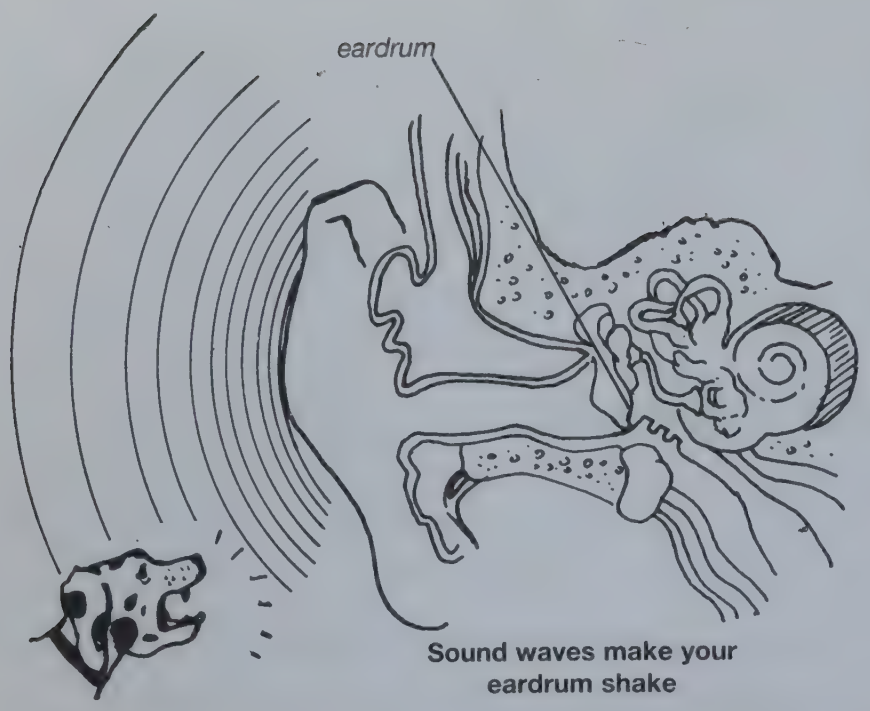
You will need :

* at least three identical glass bottles, some water, a metal teaspoon.

Air does not only carry planes and parachutes. It also carries sound. Sound travels through the air rather like waves when your drop a stone into water.



Sound travels through air like the waves in water



Sound waves make your eardrum shake

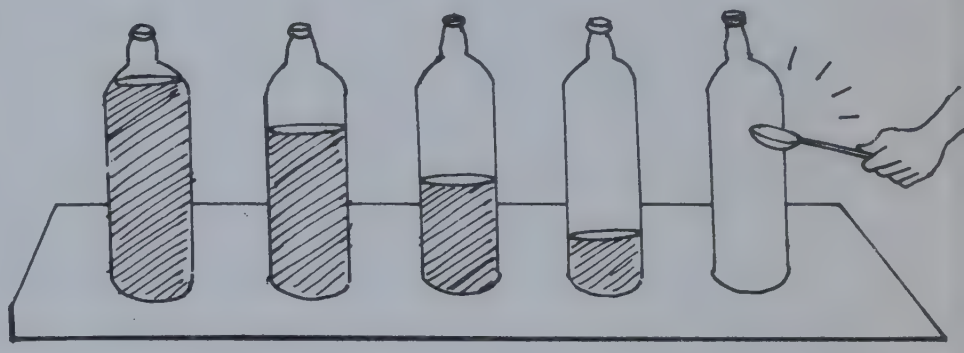
As the ripples get further away from the stone, they get weaker. Sound too gets softer the further it is from the thing which made the noise.

If the waves hit something in the water like a stick they make it move up and down. Sound waves too can move things. There is a tight skin inside your ear called the *eardrum*. When sound waves hit the ear drum, it shakes and you hear the sound.

Musical instruments make the air shake in different ways. Usually, small instruments can make high noises (like bamboo flutes). Big instruments can make low noises (like shehnais). You can see why if you do this experiment:

Put three or more identical bottles in a row. Leave the first one empty. Put a little water in the next bottle and more in the next. The last bottle should be almost full.

Strike each bottle with a spoon. Find out which has the lowest sound.



Complete the following sentences. Use some, but not all, of the words in the box.

louder	softer	air	noise	lot of	waves	high	little	eardrums	low

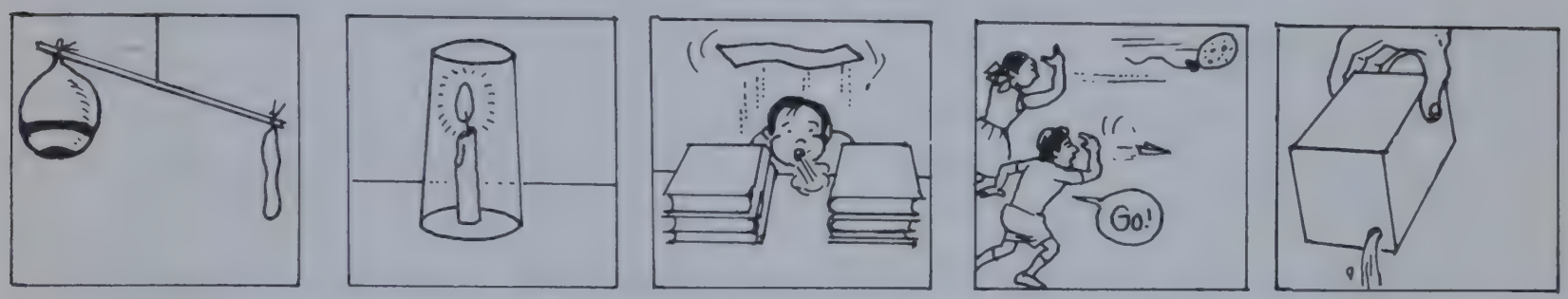
Sounds can travel through the _____. They are rather like _____. As they go away from the thing which makes the noise, they get _____. They make our _____ shake so that we hear the noise. Big instruments usually make _____ notes because they have a lot of air in them. Small instruments usually make _____ notes because they don't have much air in them. The bottle with a _____ air made a low note when we hit it. The bottle with a _____ air in it made a high note.

Revision

I. Write down the true sentences. Correct the false ones.

1. Air has no weight.
2. Air can flow from one space into another space.
3. Air expands when it gets hotter.
4. Hot air always goes down.
5. Air presses on things.
6. Moving air has more pressure than still air.
7. Streamlined shapes cannot move fast.
8. A parachute falls slowly because it is streamlined.

II. Spot the mistake in these pictures. Write what is wrong.



III. If you hit a glass bottle with a spoon, which of these variables do you think would affect (or change) the note?

1. The thickness of the glass	
2. The colour of the glass	
3. The amount of air in the bottle	would affect the note.
4. The size of the bottle	would not affect the note.
5. The length of the spoon	
6. The size of your hand	

If you are not sure about any of the answers, make all the other variables the same and try it out with two bottles (or two spoons or two hands).

Extension work

Design your own musical instrument. You could make a stringed instrument with a box and some rubber bands. You could make a wind instrument with a tube, some bamboo or some bottles. Your instrument should make at least three different notes. Or you could make three drums with three different sounds.

Even better, think up your own idea for an instrument. After you have all finished, have an exhibition and demonstration of all the instruments made in your class.

UNIT 6

Accidents and first aid

Key words

bruise : an injury to the skin which makes it go blue e.g. *I got this bruise because Mohan kicked me.*
equipment: things needed for a purpose e.g. *He has a lot of electrical equipment in his house.*
first aid: medical care which can be given by anyone straight after an accident e.g. *When Ram fell off a ladder, his neighbour gave him first aid before the doctor came.*
patient : someone who is injured or sick e.g. *The doctor examined her patient.*
rehydration : putting water back
septic : infected by bad bacteria e.g. *His cut has gone septic. There is yellow pus coming out of it.*

A. Accidents at home

ACCIDENTS WITH MEDICINE

Science has helped human beings in many ways. Science has given us medicines which have saved thousands of lives. But if medicines are used wrongly, they can harm or even kill us. Medicines should never be kept in low cupboards where young children can reach them. Children may think that they are sweets and eat them. Even a few pills or drops of medicine could kill a young child. It is also dangerous to treat yourself with medicine which a doctor has prescribed for someone else.

Sweets or pills ? Keep medicines away from children

ACCIDENTS WITH ELECTRICITY

Don't touch electrical equipment with wet hands

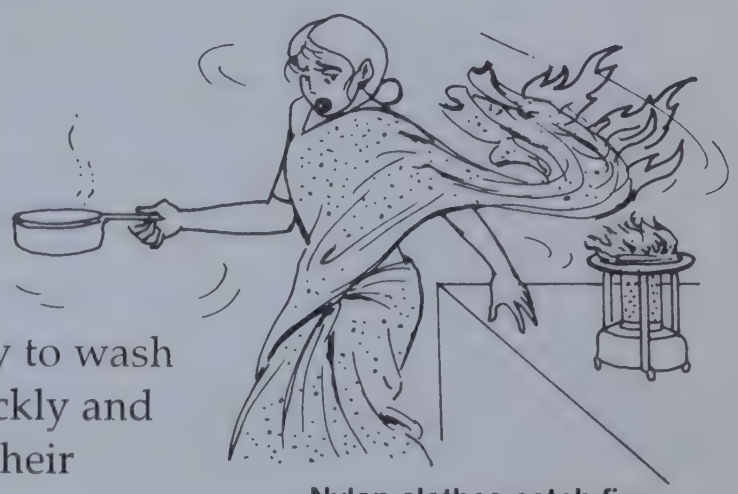
Science has also given us electricity. Fans, tape-recorders, televisions and electric lights make our lives more comfortable and enjoyable. But electricity can also kill us. Some people have lost their fingers because they have put them into table fans or food mixers. They also get electric shocks when they put their fingers into plugs or touch faulty electrical equipment. Electricity is especially dangerous when wires or our hands or feet are wet because water is a good *conductor* of electricity.

ACCIDENTS WITH COOKING STOVES

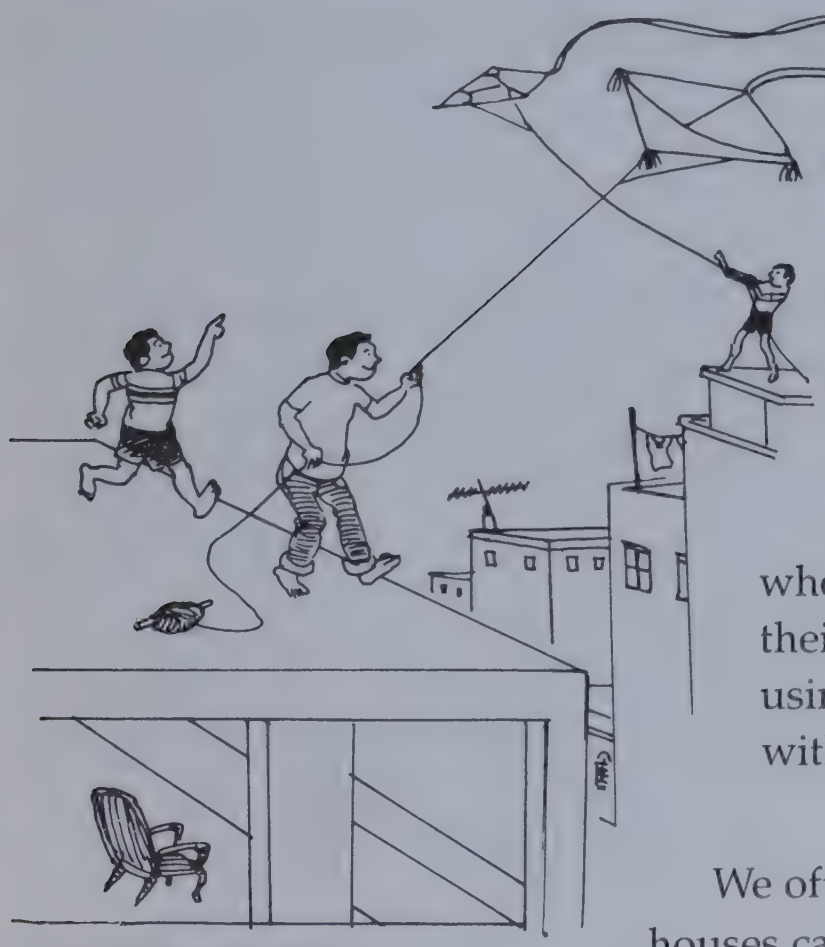
Modern gas and kerosene stoves are quicker and easier to use than wood fires, but they are dangerous too.

If you leave a kerosene stove on the floor, it is easy to kick it over. Then all the kerosene in the stove can catch fire and set your house alight.

It is also dangerous to leave very hot pans where children can reach them. Gas stoves must be used carefully. If you forget to light the gas or leave it on in a badly ventilated room, the gas can poison you or catch fire. Lastly, you must be careful with your clothes when you are cooking, especially if your clothes are made of nylon or any artificial material. These are easy to wash and do not need ironing, but they also burn quickly and suddenly. Many people die every year because their clothes catch fire from burning stoves.



Nylon clothes catch fire easily. Be careful near stoves



Don't fly your kite on a terrace with low walls

OTHER ACCIDENTS

Some accidents have nothing to do with new scientific inventions. For thousands of years, people have hurt or killed themselves by falling from heights. Many children injure themselves and even die when they fall from roofs while they are flying their kites. They can also hurt themselves while using knives or chop off parts of themselves with tools like saws or axes.

We often think that we are safe at home. But houses can be dangerous places.

Look at the picture on the next page. Discuss what accidents might happen in this house with the other children in your class.

List at least eight accidents which could happen in this house, e.g. The baby could burn himself on the iron.

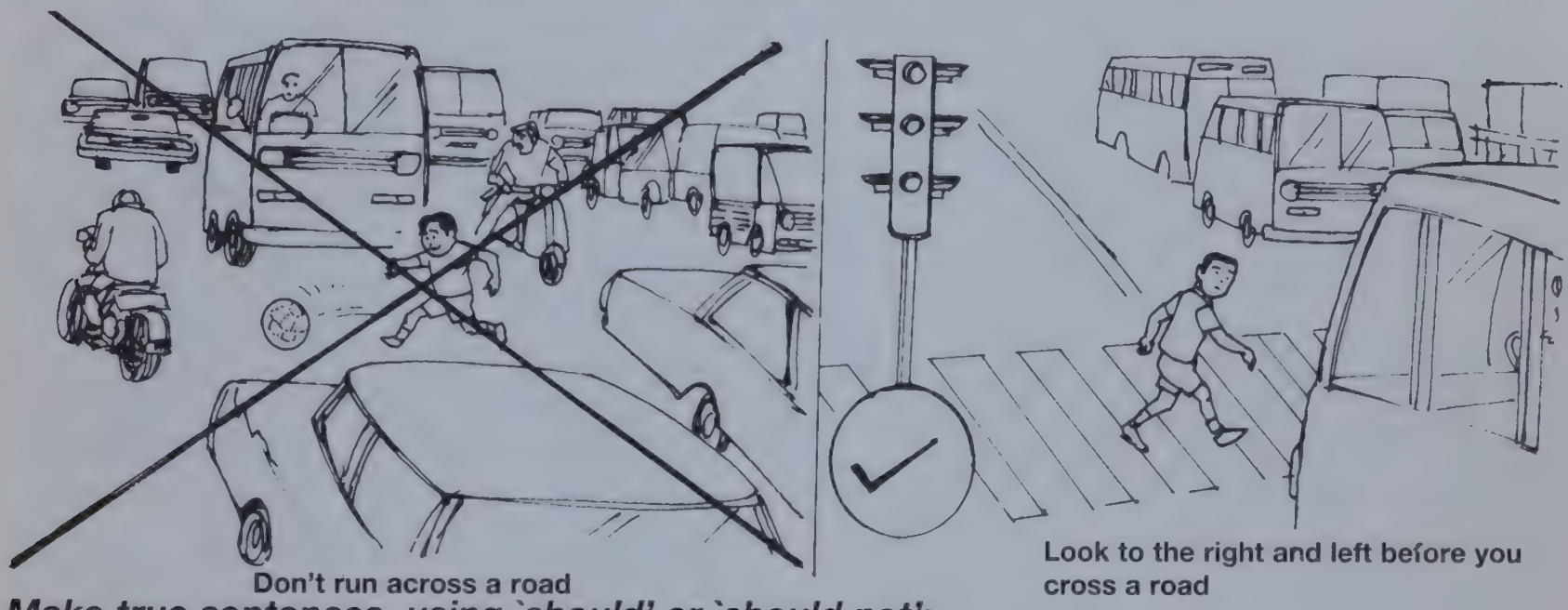
B. Road accidents

Far too many people die every year on our roads. Scooters, cars, buses and lorries are very useful and take us quickly and comfortably from one place to another. They are also very dangerous. Often drivers of motor vehicles kill people because they do not obey the rules of the road. Here are some of the most important rules for drivers of vehicles:

- All vehicles should move on the left side of the road.
- All vehicles should stop at a red traffic light.
- Vehicles can go past a traffic light when it is green.
- Vehicles turning from a small road onto a big road should give way to vehicles on the big road.
- Vehicles should give way to people walking at zebra crossings.
- Vehicles should signal which way they are turning with a light or a hand before they turn to the right or left.

Here are some important rules for *pedestrians*. Pedestrians are people who walk along roads.

1. Look both ways before you cross the road.
2. If possible, cross the road only at a zebra crossing.
3. Don't run across a road. You might slip and fall.
4. If you're not sure whether to cross the road, WAIT!
5. Never play near a road. You may forget the traffic and run into the road.



Don't run across a road

Look to the right and left before you cross a road

Make true sentences, using `should' or `should not':

Motorists	should	drive on the right of the road. stop at a red light. make a sign before they turn.
Pedestrians	should not	play beside the road. cross at zebra crossings. look both ways before they cross.

C. Accidents with fire

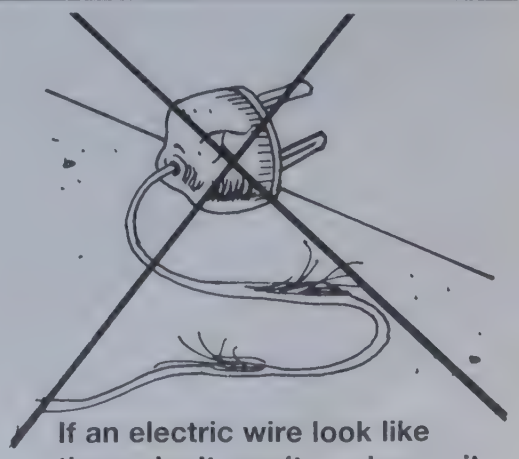
You will need (for each child) :

* a large sheet of paper for a poster, coloured crayons or paint.

We have already thought about some of the ways things can catch fire in the house. Carelessness with a cooking stove can cause fires. Faulty electrical equipment can cause fires too.

HOW TO PREVENT FIRES

- It is important to check all your electrical equipment often.
- Make sure that the wires do not come out of their plastic covering.



If an electric wire look like these don't use it — change it.

- Make sure that they do not get wet. Switch off electrical equipment when you leave the house.
- Be very careful in the kitchen. If possible, wear cotton, not nylon when you are cooking, as cotton does not burn easily.
- Put kerosene stoves on a table where they cannot be easily knocked over.
- Never change a gas cylinder while the stove is alight.
- Do not allow small children to play with matches.

WHAT TO DO IF THERE IS A FIRE

If you do have a fire in your house, the first important rule is to keep calm but act quickly. You have already learnt that fire needs air. So, if you have time, shut the windows and doors so that no more air can get to it. If it is a small fire, pour water or earth on it. Turn off the stove and all electric switches. If it is a big fire, tell your family and neighbours, leave the house quickly and call the fire brigade.

If your clothes catch fire, roll on the ground to put out the flames. When you roll on the ground, you will stop air from getting to the flames. Do not run if your clothes catch fire. It will make the fire burn more and spread.

Make a poster to teach other children in your school about

a danger in the home, OR a danger on the road, OR a danger from fire.
If you think about the different things you have learnt in this unit, you should have posters with at least 15 different points.
Remember that a poster should have a clear simple message. It should also have a bold picture which is easy to understand. Display your posters where younger children can see them.

D. First aid

WHAT TO DO WHEN SOMEONE IS BLEEDING

After an accident, you may need to give someone first aid. First aid is care given before the patient sees a doctor or nurse. It is also the care given when an injury is too small to show to a doctor.

If someone has a cut or a scratch, wash your own hands with soap and water first. Then wash the cut well with soap and drinking water. Make sure that you clean out all the little pieces of dirt in the cut. If you don't, it will go septic after a day or two. This means that yellow pus comes out and it is red and sore round the edges.

When the cut or scratch is clean, it can be covered with a clean bandage or plaster. This will stop more dirt from getting into the cut. It is important to keep a wound clean while it is healing. The plaster also helps to stop the bleeding. Never use dirty or wet cloth for a bandage — it is better not to cover it at all. It is also best not to cover a wound if you cannot get all the dirt out of it. Do not cover animal bites or deep wounds made by dirty objects.

Wash cuts immediately with soap and water

Some people use cowdung or soil to stop bleeding. Never do this. It can give people dangerous diseases such as *tetanus*.

Take all bites and deep or dirty wounds to the doctor.

If the wound is not cleaned well, it may soon go septic. If a cut goes septic, take the plaster or bandage off. Soak the wound in warm salty water so that it is easy to clean. Leave it open to fresh air, but do not let it get dirty again.

Take cuts to a doctor if:

- the patient has been bitten by an animal; a rabies injection may be needed.
- the cut is deep and dirty; a tetanus injection may be needed.
- the cut is deep and long; it may need stitches.
- the wound is badly septic and the patient has a fever.

If you have an open cut on your own hands, try not to touch another person's blood as AIDS can be spread by blood.

What first aid should be done for the following (choose from the box given below) :

1. Manjula has a deep dog bite.
2. Sunita has scraped her elbow and it is bleeding a little.
3. A long, dirty nail has gone deep into Arul's foot.
4. Nasreen cut her thumb yesterday and it has gone red and sore.
5. Surojit fell over three days ago. There is a lot of pus coming out of a wound on his knee and he has a high fever.
6. Meenakshi has fallen and has scratched her knee. There is a lot of mud on it.
7. Mani has fallen and there is a long, deep cut on his head.

- Take the patient to the doctor.
- Wash the wound with soap and water and put a plaster or clean, dry bandage on it.
- Soak the wound in salt and water; do not cover it; keep it clean.

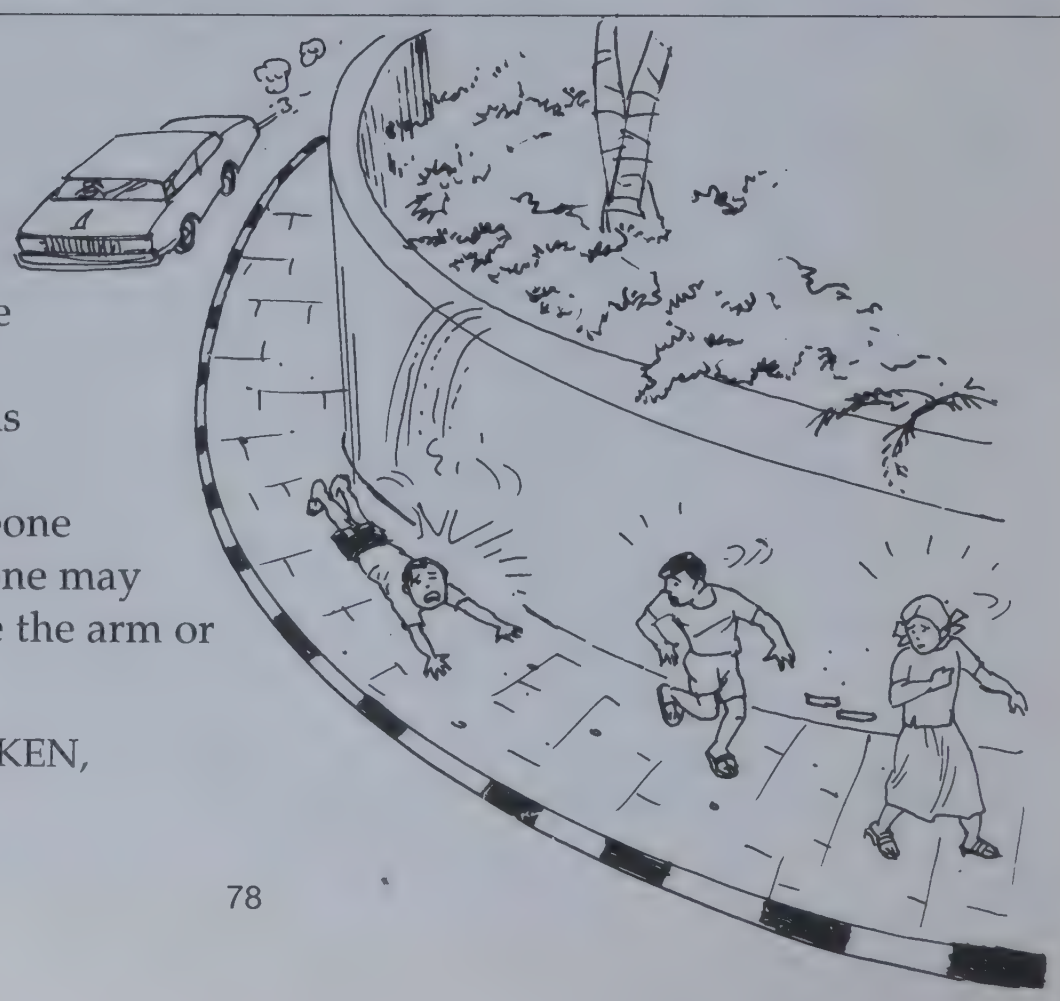
E. First aid: What to do about bruises, sprains and broken bones

You will need :

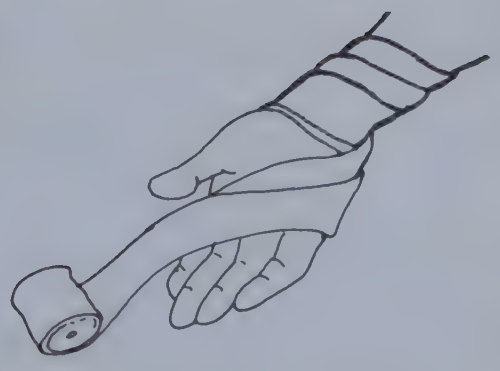
* someone who has broken an arm or leg and can remember how the accident happened; if there is nobody in your class, ask someone who has had a broken bone from another class to come to your class for five or ten minutes. Make sure that they ask their own teacher for permission.

It is sometimes difficult to know whether a bone is broken. If someone falls over and gets hurt, it may only be a bruise. Let the patient stay still for five or ten minutes to get over the shock of the fall. Usually, that is enough. But if it hurts to walk after ten or fifteen minutes, a bone may be broken in the leg. A bone may also be broken if it hurts to use the arm or hand.

IF YOU THINK A BONE IS BROKEN, DO NOT MOVE IT.



Making a sling



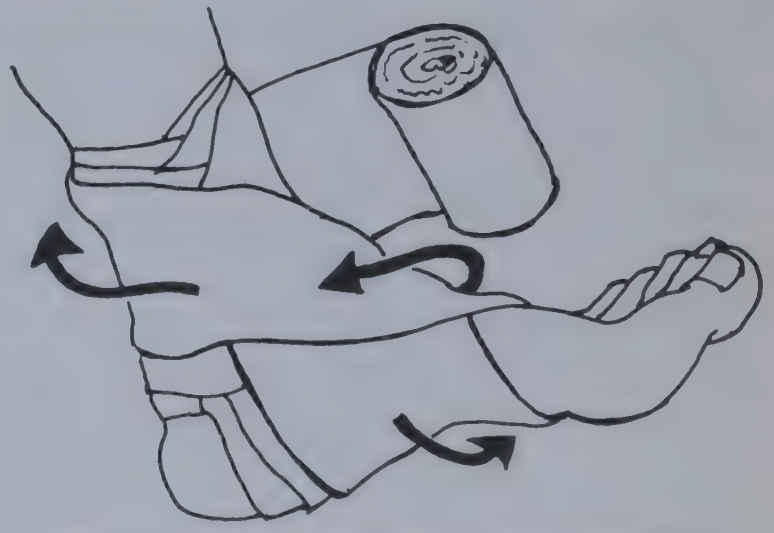
Bandaging a sprained wrist

If you think a bone is broken, take the patient to the hospital. If you think the bone of the leg is broken, do not let the patient walk. Make sure that the bone is not moved. If a bone in the arm is broken, make a simple sling so that the patient does not have to use it.

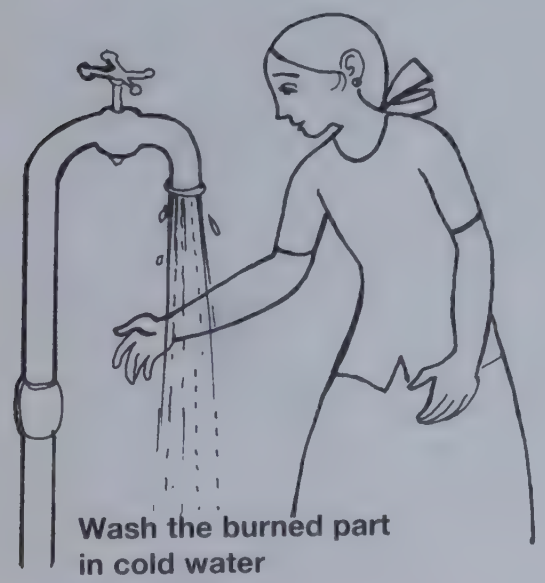
Sometimes we *sprain* or twist joints (usually in the ankle or wrist). The joint swells up and is sore when used. If this happens, keep the injured part still and rest it for several days. It may help to wrap the sprain in an elastic crepe bandage to keep it in one position. You can buy this in medical shops. For the first day, soak the sprain in cold water. After the first day, soak it in hot water two or three times a day.

Find someone who has broken an arm or a leg. Ask and write the answers to these questions :

1. Which bone did you break?
2. How did it happen?
3. What first aid treatment were you given?
4. What treatment did the doctor give you?
5. How long did it take you to get better?



Wrap a sprained ankle with an elastic bandage



Wash the burned part in cold water

F. Burns

If you have a small burn which just goes red, put the burned part in cold water at once. You do not need to do anything else.

If you have a burn that is forming blisters, it is more serious. Blisters are swellings like bubbles under the skin. Do not break open the blisters. If they do break, wash them with soap

and clean water. Leave them uncovered, but do not let them get dirty. If you have to go out into the dusty street, spread some vaseline on a clean, ironed cotton cloth. Then wrap the cloth lightly around the burn. Do not put butter, oil, ink or cowdung on burns.

If you have very big burns, go to a doctor at once. Make sure that you drink plenty of water or rehydration drink. You will learn how to make this in the next lesson.

Write the sentences which are true. Correct those which are not true.

1. If you get a small burn without blisters on your finger, you should put it in cold water for a few minutes.
2. If you burn your hand, you should put butter on it.
3. You should never put cowdung on a burn.
4. If your burn has blisters, you should keep it clean all the time.
5. If you are in a clean place, you should leave your burn uncovered.
6. If you are in a dusty place with a lot of flies, you should leave your burn uncovered.
7. Put vaseline on any old piece of cloth and wrap it around the burn.
8. If you are badly burned, you do not need to go to hospital.
9. You should drink a lot of water or rehydration drink.

G. First Aid: Diarrhoea

You will need :

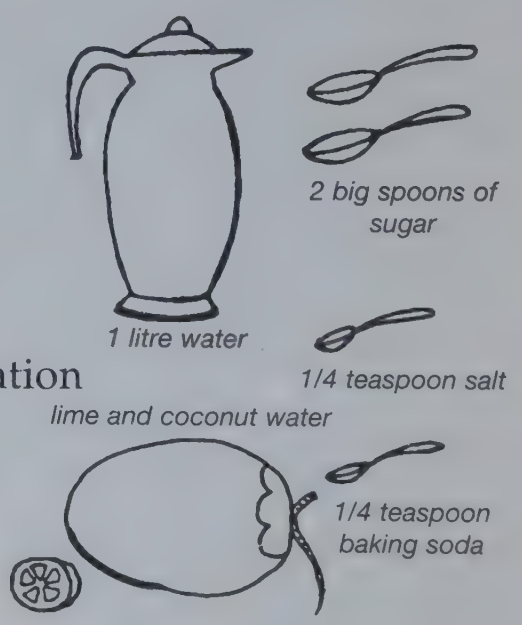
* a litre jug of drinking water (boiled if possible), two level serving spoons of sugar, 1/4 teaspoon of salt, and (if possible) 1/4 teaspoon of bicarbonate of soda; if you cannot get this, use another 1/4 teaspoon of salt, (if possible) the juice of a lime or some coconut water, some drinking glasses.

There are many causes of diarrhoea, but the treatment is usually the same. Drink plenty of liquids. When you have diarrhoea, your body loses a lot of liquid. You must take water in as fast as it goes out or you will become very ill. The best drink for people with diarrhoea is called *rehydration drink*. This is how you make it.

Mix all the ingredients shown in the figure in a jug of drinking water.

Make it in class. Then each of you can taste it. It's very nice! Rehydration drink is easy and cheap to make. It has also saved thousands of lives, especially the lives of babies and young children.

If you have diarrhoea, you should drink a glass of rehydration drink after every time you go to the toilet. If you are vomitting too, take a sip every five minutes. When you are beginning to feel better, drink some buttermilk or eat soft bananas. Do not eat any oily food for several days.



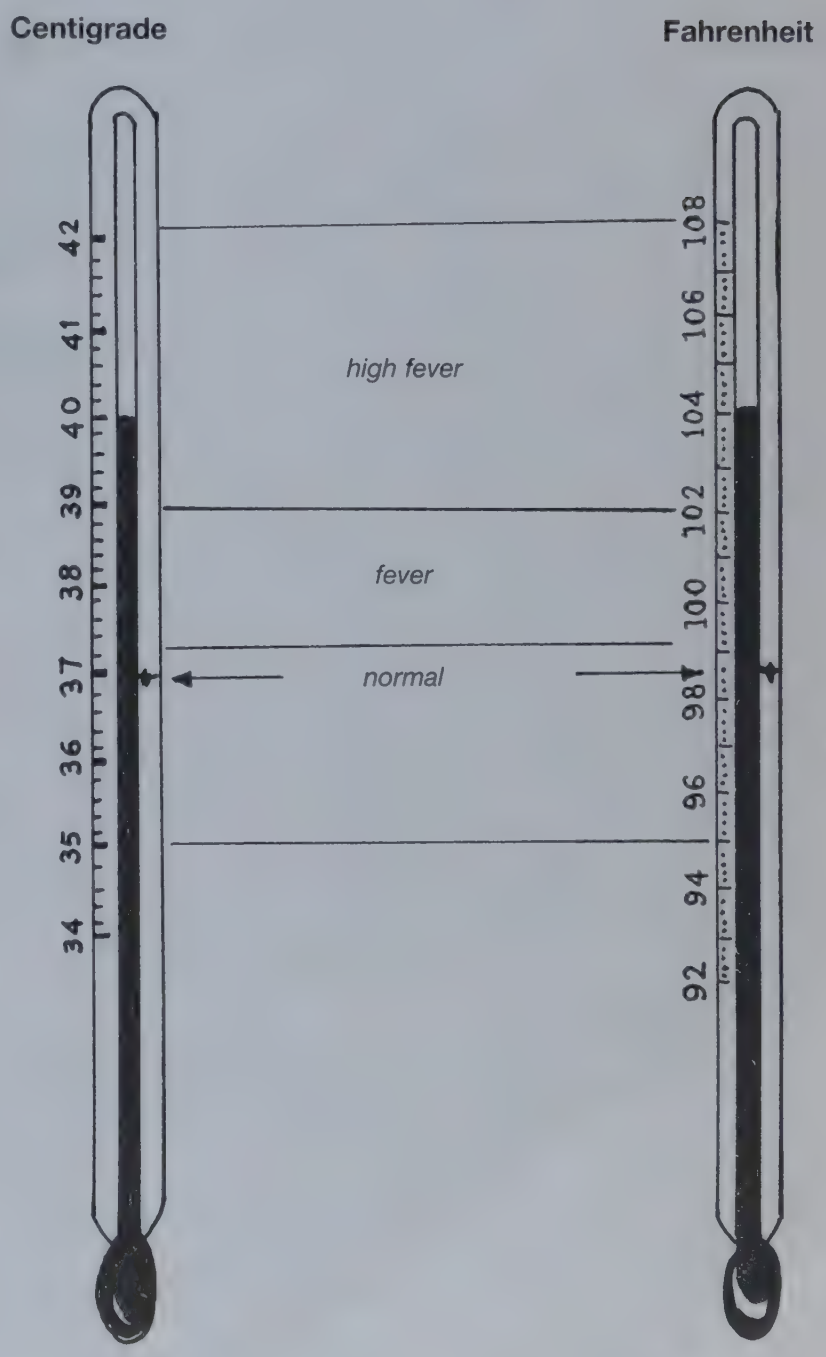
You need to go to the doctor if:
- you have fever and diarrhoea,
- your diarrhoea does not stop after a day or two,
- you have a bad stomach ache,
- when you go to the toilet you pass out blood.

Answer these questions.

1. How do you make rehydration drink?
2. Why should people with diarrhoea drink rehydration drink?
3. How often should they drink it?
4. What can they eat when they start to get better?
5. What are the four danger signs in a patient with diarrhoea?

H. First aid: Fever

When people get a fever, they get very hot. The normal body temperature of human beings is 37 degrees centigrade (or 98.4 degrees fahrenheit). If the temperature of their bodies goes higher than this, they have a fever. If their temperature goes higher than 39 degrees centigrade, they have a high fever and are very ill. Learn to take someone's temperature with a thermometer.



A fever is not a disease. It shows that something is wrong and your body is trying to fight an illness. It can be a sign of many different illnesses. Flu, malaria, measles, chicken-pox, typhoid and many other diseases cause fever.

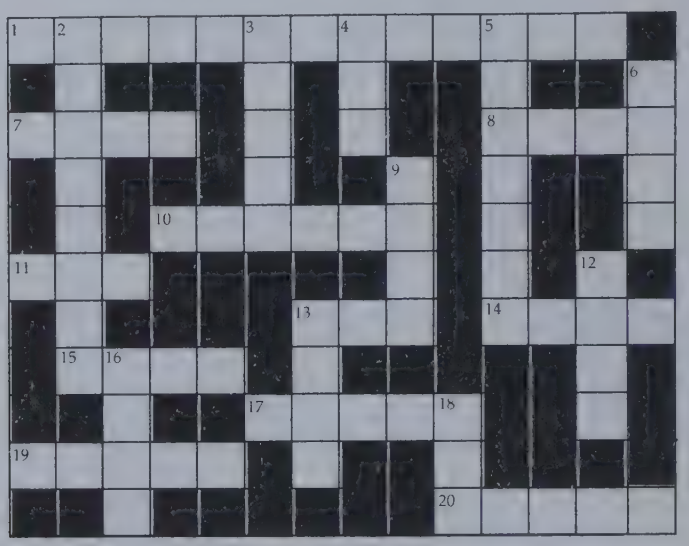
If you have a fever, do these things:
- KEEP COOL. Never wrap yourself up in a lot of covers.
- Wear light cotton clothes.
- Lie where there is fresh air or a breeze.
- Ask someone to sponge you with a wet cloth.
- Drink plenty of water.
- If you have a fever for more than a day or two, go to the doctor.

Complete these sentences:

1. 94.5 degrees fahrenheit is _____ degrees centigrade.
2. 40 degrees centigrade is _____ degrees fahrenheit.
3. The right temperature for healthy people is _____ degrees centigrade.
4. You have a high fever when your temperature goes above _____ degrees centigrade.
5. If you have a fever you should keep _____ .
6. You should also drink a lot of _____ .

Revision

I. Try this crossword!



Clues across

1. If possible, try to cross the road at a _____ _____ .
7. If a cut is long and _____ , it may need stitches.
8. Before you cross a road, always _____ to the right and the left.
10. When you are getting better from diarrhoea, eat a _____.
11. If you bandage a wound, make sure that the cloth is clean and _____.
13. If you _____ your hand with knife, wash it at once.
14. If you are bleeding, wash the wound with water and _____ .
15. If you burn your finger, put it into _____ water.
17. Do not _____ a wound made by a deep bite.
19. Do not fly a kite on a terrace with low _____.
20. _____ change a gas cylinder when the stove is on.

Clues down

2. If you touch a switch with wet hands, you may get an _____ shock.
3. If you have a bad burn, you must keep it _____ .
4. Always take _____ the dirt before you cover a cut.
5. A fever is a sign of _____ .
6. When you burn your _____ , a blister may form.
9. Rehydration drink is made by mixing water, sugar, baking soda and _____ .
12. If there is a fire, you must keep _____ .
13. If you have a fever, you must keep _____ .
16. If you are getting better from diarrhoea, you must not eat _____ food.
18. Do not _____ across a road or you may slip over.

II. Match these words to their meanings:

1. sprain	someone who walks along the road
2. bruise	red and swollen, with pus coming out
3. pedestrian	a swelling like a bubble under the skin
4. fever	care given before the doctor comes
5. rehydration	a temperature over 37 degrees centigrade
6. blister	a dark mark on the skin
7. septic	putting liquid back into the body
8. first aid	a twisted and swollen joint

III. What first aid would you give for

1. a grazed knee?
2. a sprained ankle?
3. diarrhoea?

Extension work

Write a story about an accident. Make sure that at least one person in the story knows what kind of first aid to give.

For the teacher :

If possible, ask a doctor or nurse to come and give a talk about their work to your pupils. It might be a parent or friend. Give the children an opportunity to ask questions about fears or doubts they might have.

Measure the children's height as you did in Unit 4. Make a graph of their growth over the past few months. Ask them to write about their own growth and that of their friends. Discuss how a good diet helps us to grow.

UNIT 7

Work, force and energy

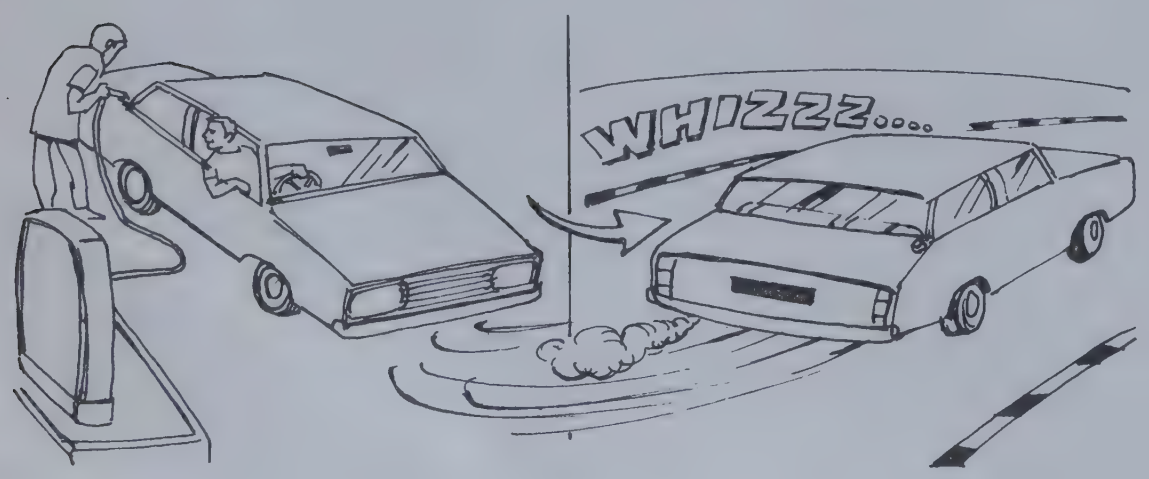
Key words

ball bearings: small balls which help a wheel to turn easily
circuit: a path along which electric current flows
energy: the power to do work e.g. *People get energy from food.*
forces: pushes and pulls which use energy
friction: the rubbing of one thing against another e.g. *If you push a book across a table, friction makes it stop.*
gravity: a natural force which pulls things down to earth
inclined plane: a flat surface which makes a slope e.g.*The hospital ramp is really an inclined plane.*
lever: a tool which helps you to move or lift things e.g. *I used a spoon as a lever to get the lid off the tin.*
pulley: a wheel with a groove which helps people to lift things
windmill: a machine which moves because of the wind

A. Energy

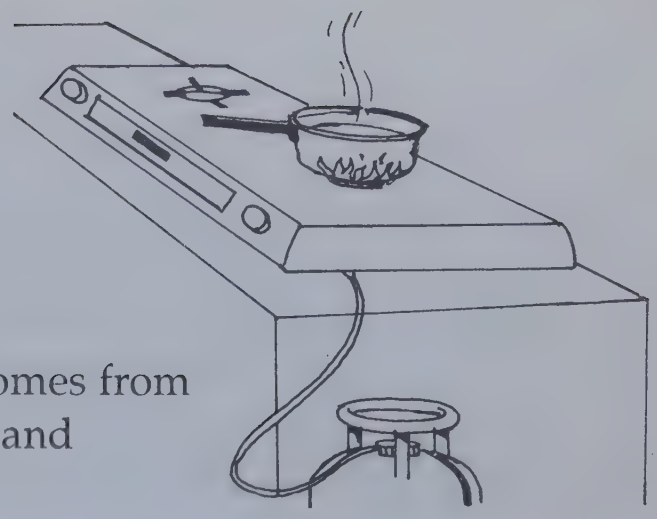
In this unit, we will learn about energy and forces. We will also look at some of the ways we use forces to make simple machines work.

When you run about in the playground, you use energy. Your fuel is food.



When a car whizzes along the road, it uses energy. Its fuel is petrol.

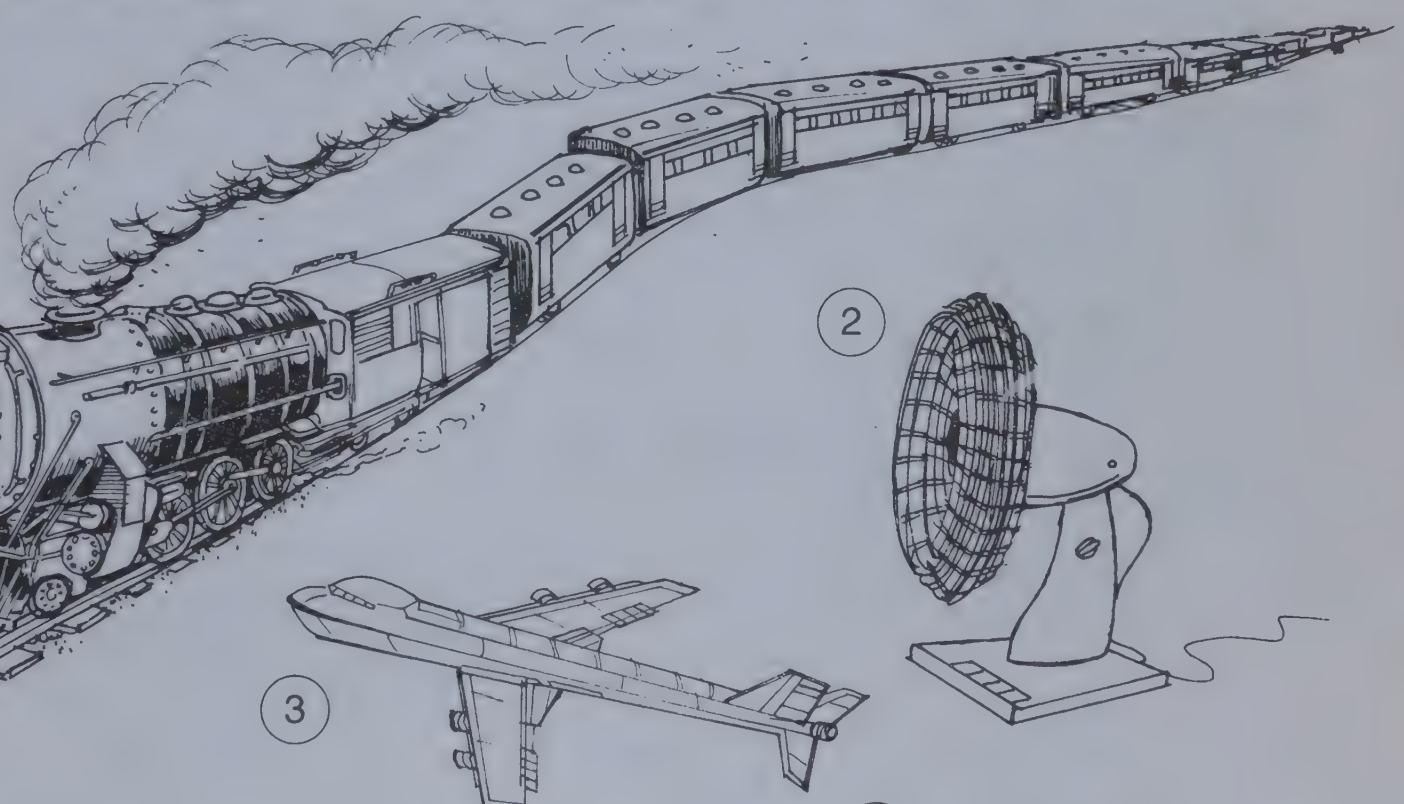
When a stove heats a pan of milk, it uses energy. Its fuel is gas, kerosene, wood or cowdung.



There are many different kinds of energy. Energy comes from *the sun, the wind, moving water, electricity, burning fuel* and *eating food.*

Look at the pictures below. Say where the energy comes from in each case. You may need to think hard. For example, a steam engine does not really get its energy from steam. Burning coal heats water. The boiling water gives out steam. The steam pushes a piston up and down. The piston pushes the wheels of the engine around. This moves the train. So the first energy comes from burning fuel.

1



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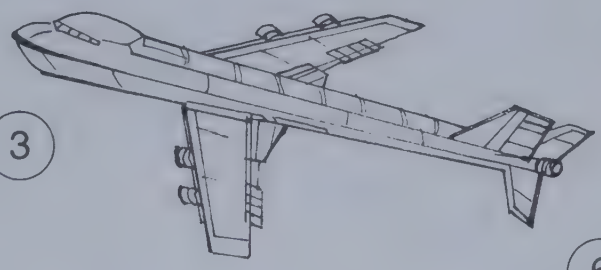

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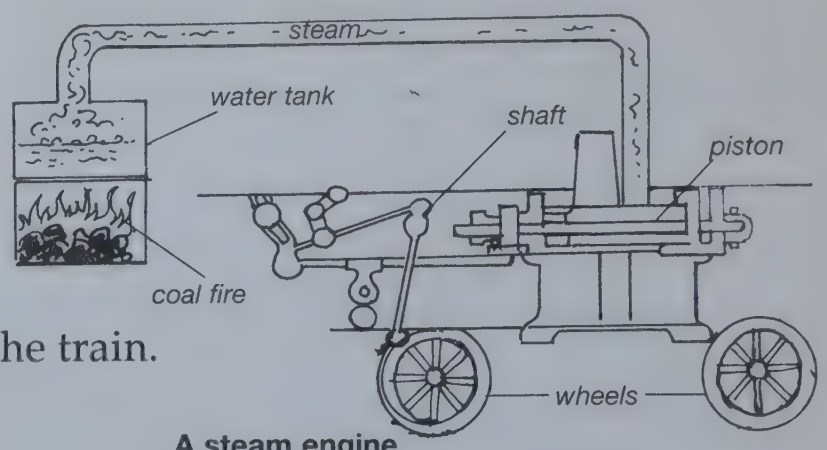
6

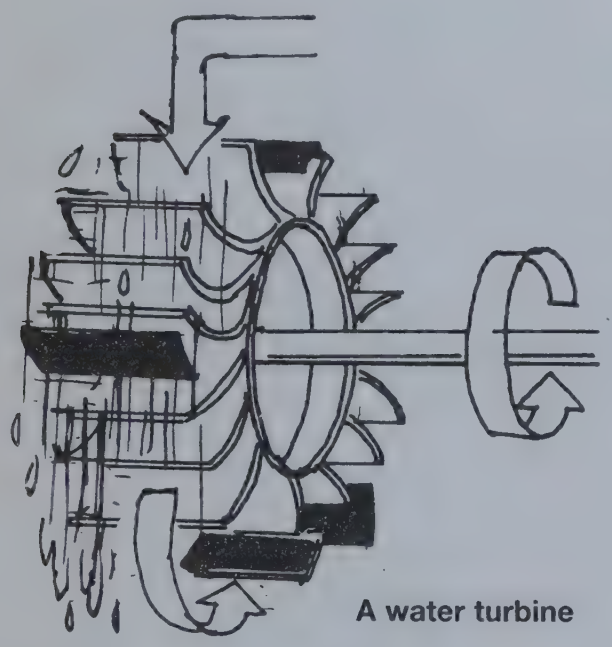
B. Changing energy

Energy can make different things happen. Energy can make heat. Energy can make light. Energy can make electricity.

Energy can also be changed from one kind of energy to another kind of energy. For example, burning fuel in a steam engine changes heat energy into movement. The steam pushes a piston up and down. The piston moves the wheels of the train.



A steam engine



A water turbine

Also, movement can be changed into electrical energy as seen in a water turbine. The waterfall turns a wheel. The wheel moves a machine which makes electricity. In a similar way, the wind, sunlight and burning coal can make electrical energy too.

Electrical energy can be changed into heat energy, light or movement. For example, electricity makes an iron get hot. It lights up a light bulb. It makes a fan move round.

Make true sentences from this table:

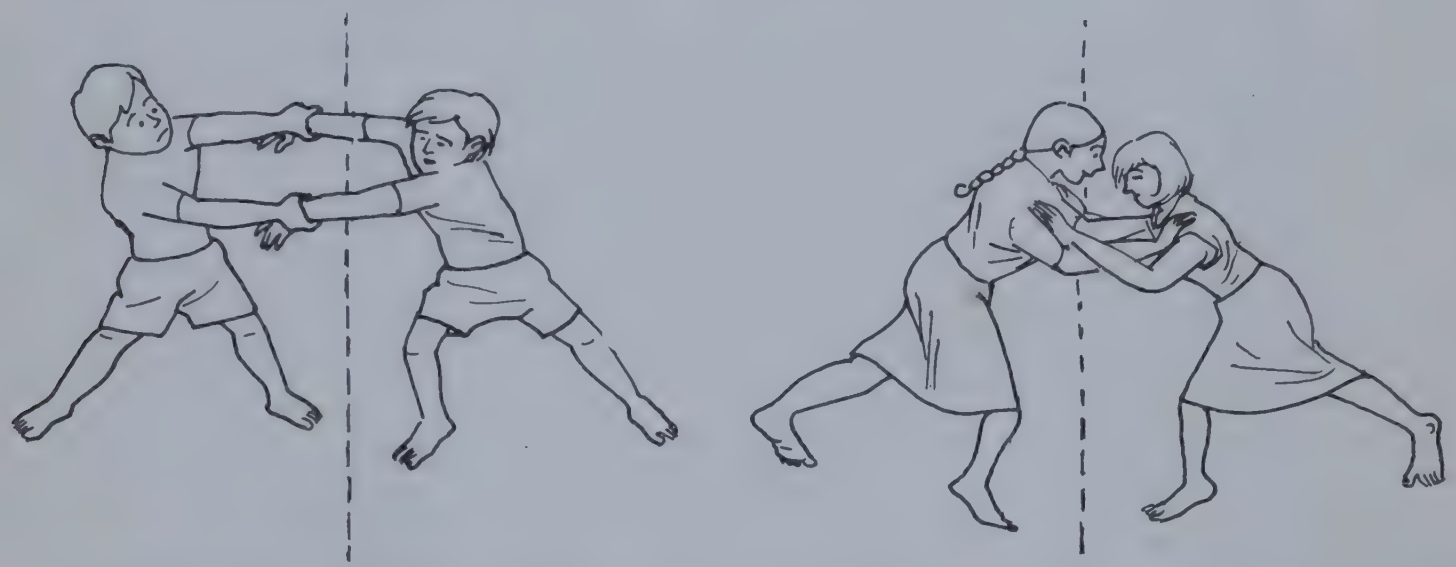
1. A car engine changes burning fuel into	light.
2. A water turbine changes movement into	heat.
3. An oil lamp changes burning fuel into	electricity.
4. An immersion heater changes electricity into	movement.
5. A power station changes burning fuel into	
6. An electric food mixer changes electricity into	
7. A torch changes electricity into	

C. Forces

You will need (for each pair of children):

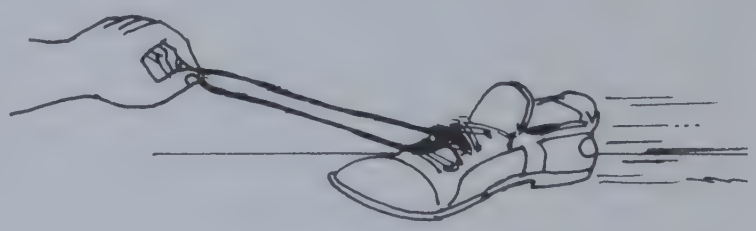
* a rubber band, a shoe.

Forces are pushes and pulls. When you push or pull something, you make it move. Go outside. Work with a partner who is about the same size as you. Draw a line in the dust. With one of you on each side of the line, try to pull the other person to your side of the line. Then try to push your partner backwards so that you can cross the line. Which of you has the greater force? Which is easier — pushing someone who is standing still or pushing someone who is already moving backwards? Is it easy to push when your friend is pushing you backwards?



You probably found that it was easier to push your friend after he/she was going backwards. It is difficult to move something when it is still. It is easier to push something after it has started to move away from you. But it is very difficult to push something when it is already moving towards you.

Work in your pairs. Tie a rubber band to a shoe. Pull the shoe along the ground. Look carefully at the rubber band. When does it stretch the most? Is it easier to pull the shoe when it is still or when it is moving? The longer the rubber band, the harder you are pulling.



Answer these questions:

1. Did you win or lose the pushing match?
2. Did you win or lose the pulling match?
3. Was it harder to push your friend when he/she was still, or moving backwards?
4. Was it harder to push your friend when he/she was still, or moving forwards?
5. Was the rubber band longer when the shoe was still or moving?
6. Did you use more force when the shoe was still or moving?

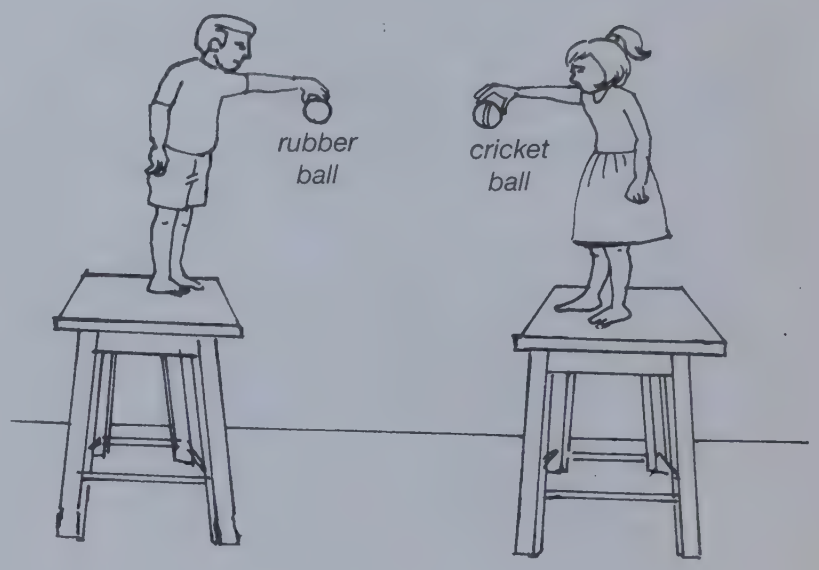
D. Gravity and weight

You will need :

* two things of the same size and shape but different weight (e.g. a hollow plastic ball and a cricket ball, a marble and a ball of clay of the same size, a plastic spoon and a metal spoon).

Gravity is a natural force. It pulls things down to the earth. When you drop something, gravity pulls it down.

Today we are going to do an experiment with gravity. Find two things which are of the same size and shape, but of different weight. First guess. If you drop them both from the same height, which do you think will hit the ground first? Or will they hit the ground at the same time?



Write your guess in your notebook now.

I guess that	the light ..... will land first. the heavy ..... will land first. they will both land at the same time.

Do the experiment.

Write your result like this:

The light ..... landed first.
The heavy ..... landed first.
They both landed at the same time.

Try the experiment with other things. First write your guess. Then do the experiment. Finally write the result. You probably found that both objects landed at the same time.

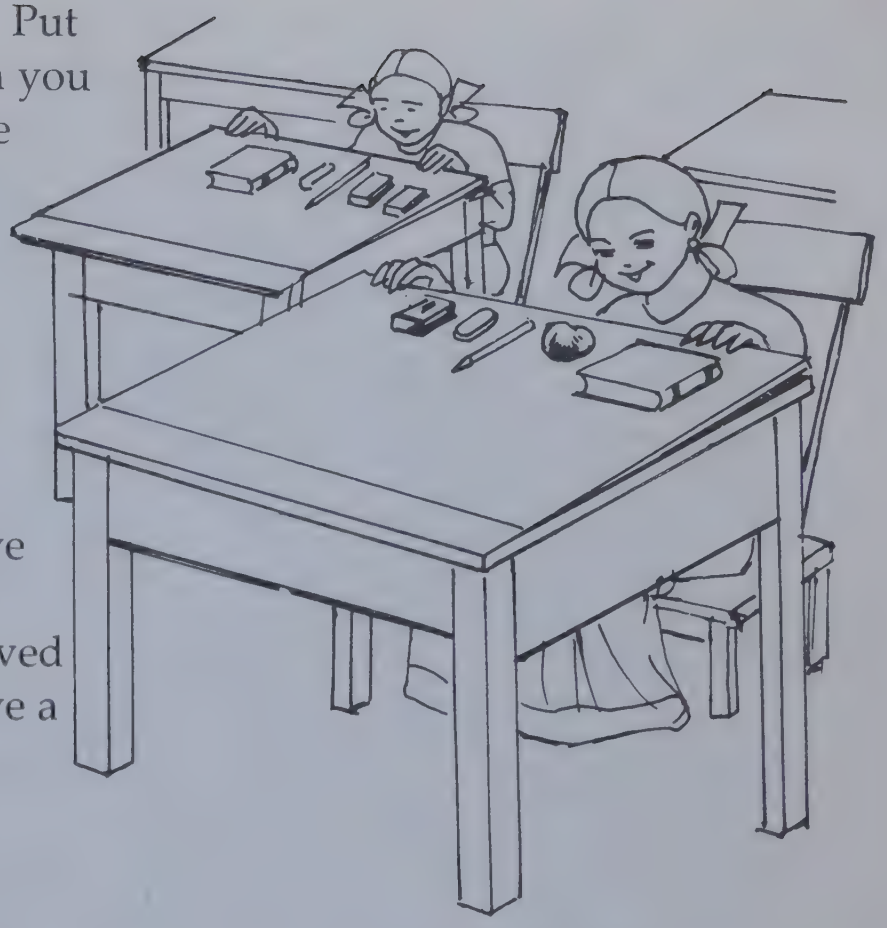
E. Friction

You will need:

* a big hard-back book or a desk lid, a rough stone, a rubber, a pencil, two empty matchboxes.

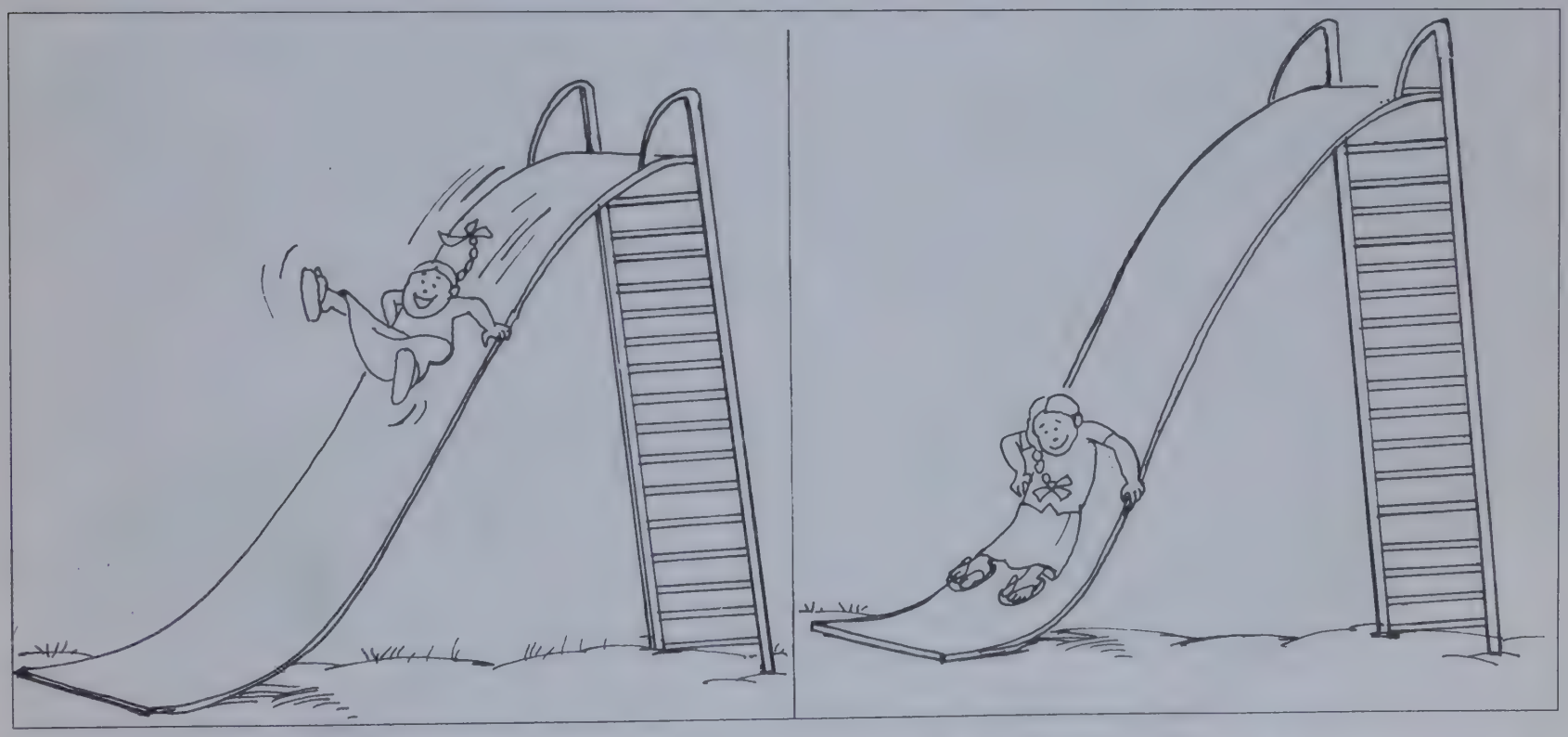
Put all the things listed above in a line at one end of a large book or at the lifting edge of a desk lid. Make sure that the desk lid or book is horizontal (not sloping) to begin

with. Put one matchbox on its smooth side. Put the other match box on its rough side which you use to strike a match. Very slowly, lift up the lid. with the objects on it. Find out which object starts to move first on the book or desk. Find out which object starts to move last.



The objects which moved first were probably smooth. Smooth things do not have much friction. Friction is the rubbing of one thing against another. The things which moved last were probably rough. Rough things have a lot of friction.

A slide is smooth so that you can move down it fast. You have to sit on your clothes which are smooth too. But if you want to stop yourself, put your feet down. The rubber at the bottom of your shoes is not smooth. When it touches the slide, there is a lot of friction, so you stop.



Wet things do not have much friction. This is why people sometimes slip over in the mud or on a wet floor. When people want machines to run smoothly, they add a little oil to the moving parts. The oil makes the machines slippery so that there is not much friction between the moving parts.

Choose the best words from each box in the sentences below and complete the description of your experiment. Add to the list of the things you tested. Put them in order.

An experiment with friction

We put some things at the edge of a | desk | book | table | Then we tipped it.

The things with | most | least | friction moved last. The things that moved first are at the beginning of this list. The things that moved last are at the end: 1.....

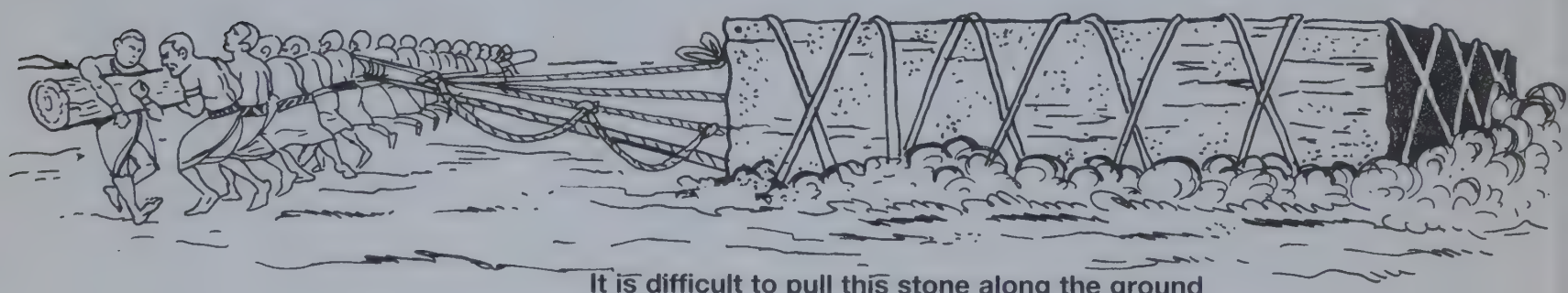
2..... 3..... 4..... 5..... 6.....

F. Wheels

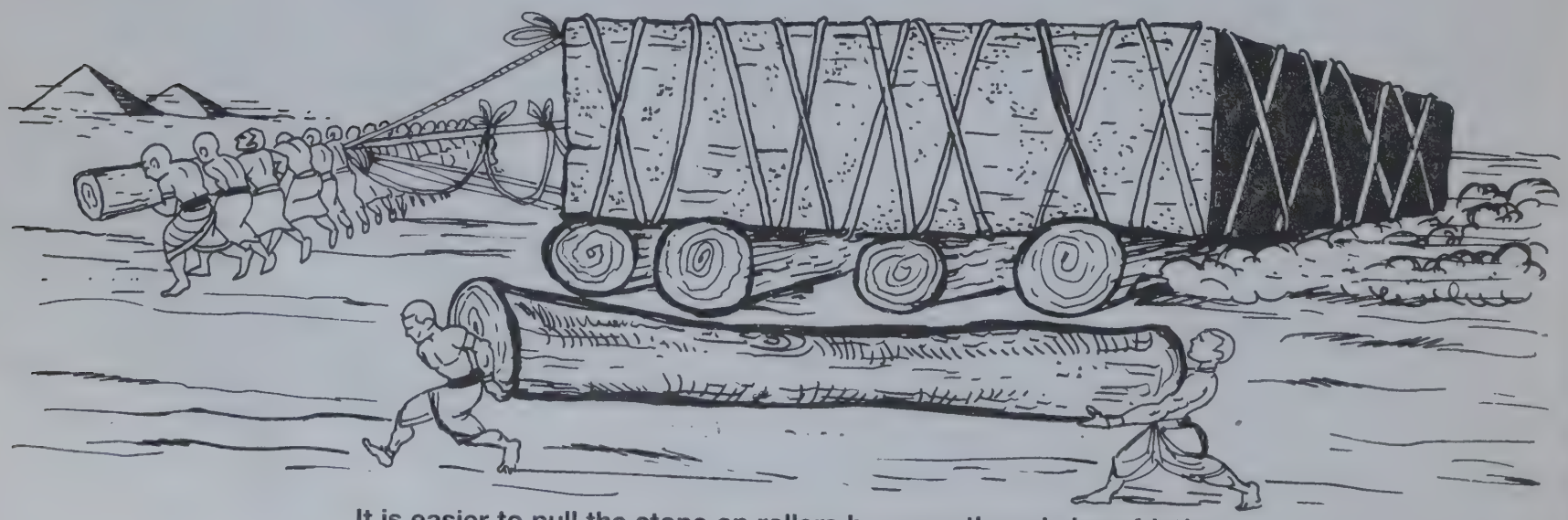
You will need:

* a book, at least eight pencils with round ends, clay, the sticks from a broom.

When the ancient Egyptians built the pyramids, they discovered something very important. It was very difficult to pull heavy weights along the ground. It was much easier to pull the heavy weights along on *rollers*.



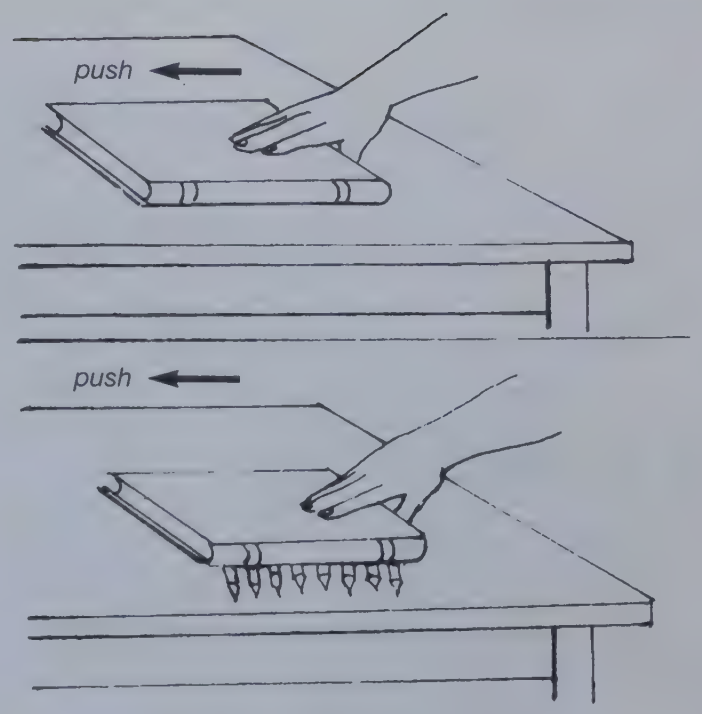
It is difficult to pull this stone along the ground



It is easier to pull the stone on rollers because there is less friction

Do this experiment to understand how rollers work:

Try pushing a book along your table. Then put it on eight round pencils. The pencils make it easier to push the book along the table. When the book slides off the pencils at the back, put them at the front so that you can move it further.

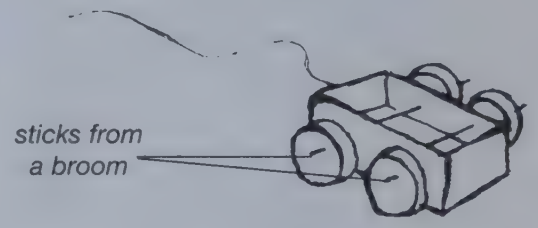


Long after people discovered rollers they discovered that they could attach wheels to carts. This was easier still because people did not have to move the rollers to the front of the heavy object all the time.

Wheels must be round. Many wheels have rubber tyres. The rubber makes friction stop the wheels from sliding in the wrong direction or spinning round on a wet road.

Make a cart with clay and sticks from a broom. Make sure that the wheels are round and that the hole for the broomstick is not too small.

Try out your cart with your friends. The best carts will travel furthest with the same amount of push on the surface of the same floor.



clay cart

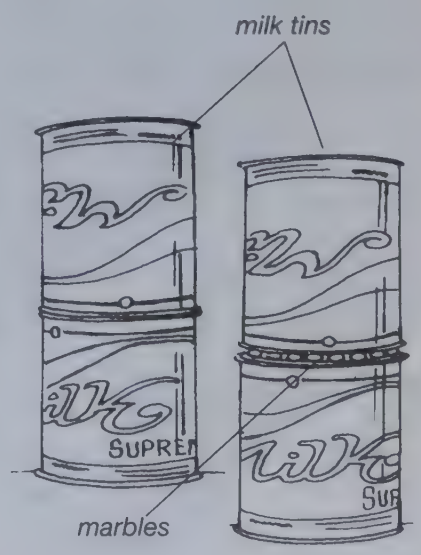
G. Ball-bearings

You will need:

* two identical empty tins with rims (e.g. milk powder tins), about 20 marbles of the same size.

Take the lids off the two tins. Turn one tin upside-down and put it on top of the other tin. The rim of one tin should rest on top of the rim of the other tin. Find out whether the top tin turns easily.

Now, put some marbles on the rim of the bottom tin so that there is a little space between each one. Then put the other tin on top. It should still be upside-down and should rest on top of the marbles. Find out whether it turns easily.



The marbles work as *ball bearings*. We use ball bearings on a bicycle wheel, a car wheel or a potter's wheel. They make the wheels turn easily because there is not much friction.

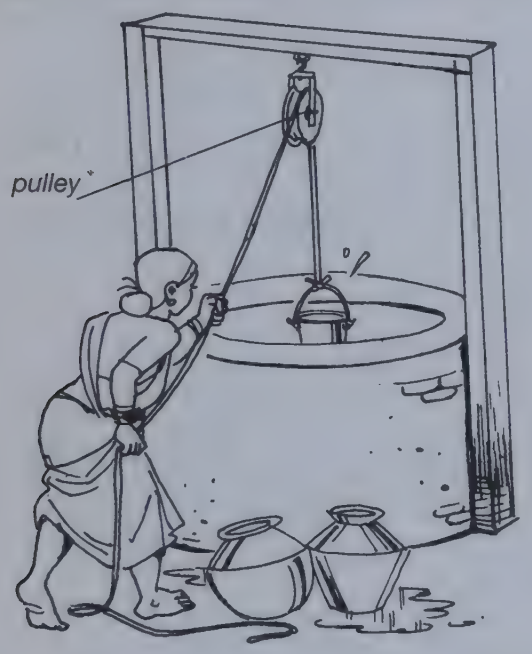
Now write six true sentences, using the table below:

When we didn't use marbles,	the top tin turned smoothly. the top tin did not turn smoothly. the top tin didn't stay in place.
When we did use marbles,	the top tin stayed in place. there was less friction. there was more friction.

H. Pulleys

You will need :

* two tables of equal height, a long round pencil, an old cotton reel, an empty camera roll or sticking plaster roll, about a metre of string, sellotape and a weight (e.g. a shoe).



Wheels help us to move things from one place to another. Ball bearings help us to turn things. *Pulleys* help us to lift things. This lady is pulling water up from a well. The pulley helps her to lift the weight.

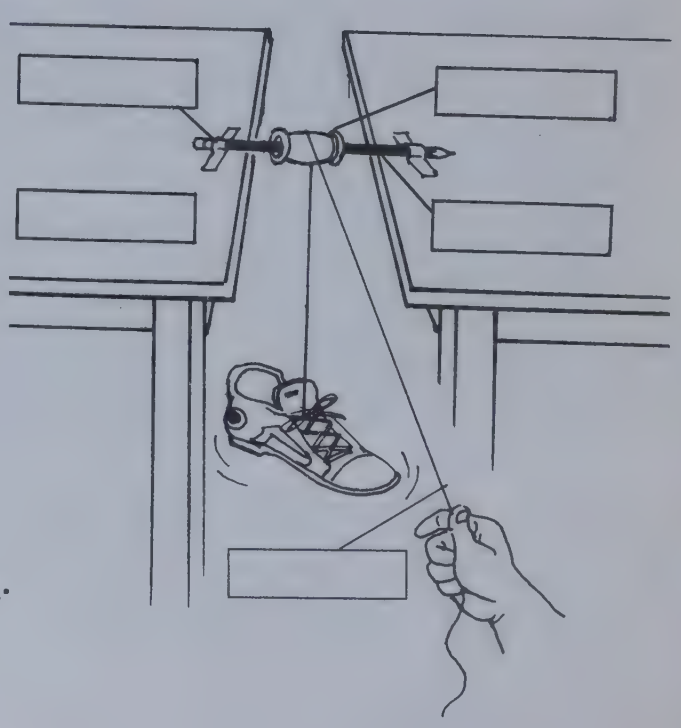
Make your own pulley. Look carefully at the diagram. Label it, using the words in the box below. Then complete the instructions on the next page.

Making a pulley :

sellotape	*cotton reel*	*table*
pencil	*string*	

Complete the sentences.

1. Put two tables quite close together.
2. Put a _____ through a cotton reel.
3. Rest the two ends of the pencil on the two _____.
4. Stick them to the tables with _____ .
5. Tie a weight to a piece of _____.
6. Put the string over the _____.
7. Pull up the weight.



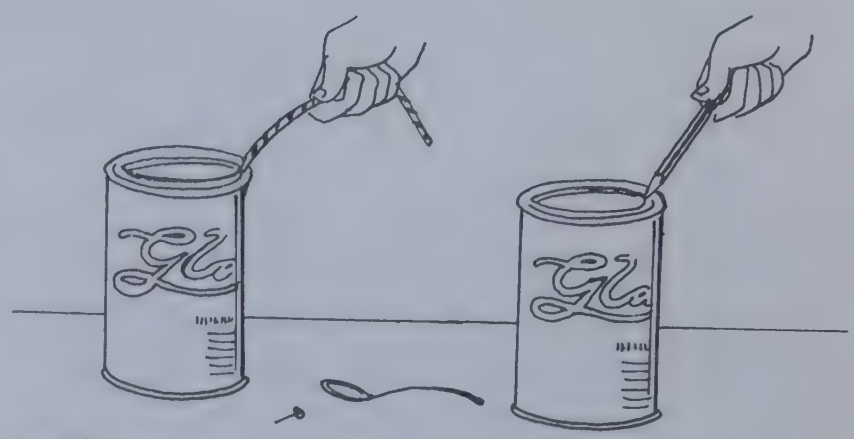
I. Levers

You will need:

* a pin, a drinking straw, a pencil, a metal spoon, a tin with a tightly fitting lid (e.g. a milk powder tin).

People often lift heavy loads or open tight lids with *levers*. Try to lever off the lid of a tin with each of the things listed above. Find out which is the best lever.

Ask yourself what makes a good lever. Should it long or short, soft or hard, stiff or bent? Also find out which do not make good levers. Ask yourself why they are not good levers.



Now answer these questions and give explanations.

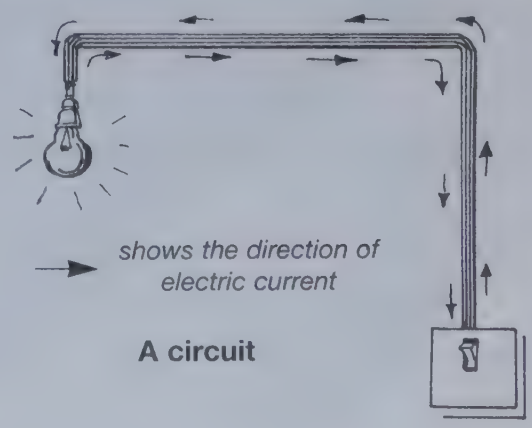
1. Did the straw work well? Why?/Why not?
2. Does it help if you make the end of the straw flat?
3. Did the pin work well? Why?/Why not?
4. Which end of the pin worked best under the lid — the sharp end or the thick end?
5. Did the pencil work well? Why?/Why not?
6. What happened if you put the lead of the pencil under the lid?
7. What happened if you tried to put the thick end of the pencil under the lid?
8. Did the metal spoon work well? Why?/Why not?
9. Do you think a plastic spoon would work as well as a metal spoon? Why?/Why not?

J. Making an electric circuit

You will need (preferably for each group of four to six children):

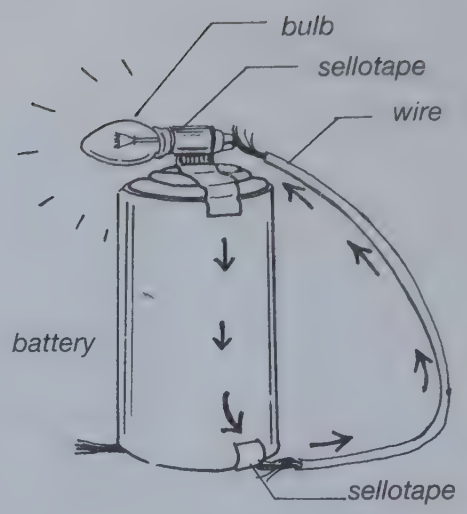
* a torch bulb, a piece of wire (if it is plastic covered, take off at least 1 cm of the plastic at each end of the wire with a knife), a torch battery, sellotape,
* If you design your own switches, you will need some paper clips, press studs, scissors, sellotape, drawing pins, card.

When you turn on a light, electricity flows through a wire to the bulb and then back through another wire to the switch. This is called a *circuit*. If you break the circuit at any point, the light will not come on. A switch turns off the light by making a gap in the circuit.



A circuit

Today, you are going to make an electric circuit. Hold a bulb sideways against the metal part at the top of a battery. Press one end of the wire against the bottom of the battery. Press the other end of the wire to the bottom of the torch bulb. See if you can make the bulb light up. Your connections will be firmer if you use sellotape.



When the bulb lights up, you have made a circuit. The electricity flows from the battery through the wire to the bulb. Then it goes back into the top of the battery. If either end of the wire does not touch, you have broken the circuit and the light will go off.

If you can, get into groups of four and design your own switches. Use what materials you can find. You should be able to turn on your light and leave it on. You should also be able to turn it off. To do this you must be able to break your circuit and put it together again easily. You must also make sure that your connections are firm. Discuss your design with your group quietly !

In your own words, write how you made a circuit. If you made a switch, describe how you made it and draw a diagram of it. Say if you changed your design in any way and why.

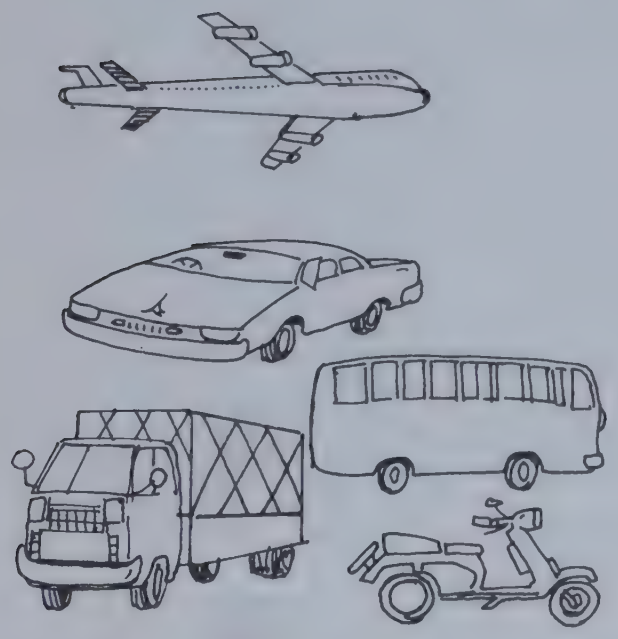
K. Sources of energy

Every time we use force, we need *energy*. You learnt earlier that there are many different kinds of energy. Animals get their energy from food. Machines can get their energy in different ways, for example from the sun, the wind, moving water, electricity or burning fuel.

FOSSIL FUELS

There are many different kinds of fuel. Nowadays, a lot of machines use *fossil fuels*. Fossil fuels are remains of plants and animals which get buried under the earth and get hardened over millions of years. Oil, petroleum, coal and natural gas are fossil fuels.

These oil wells take oil from under the sea



These vehicles use petroleum

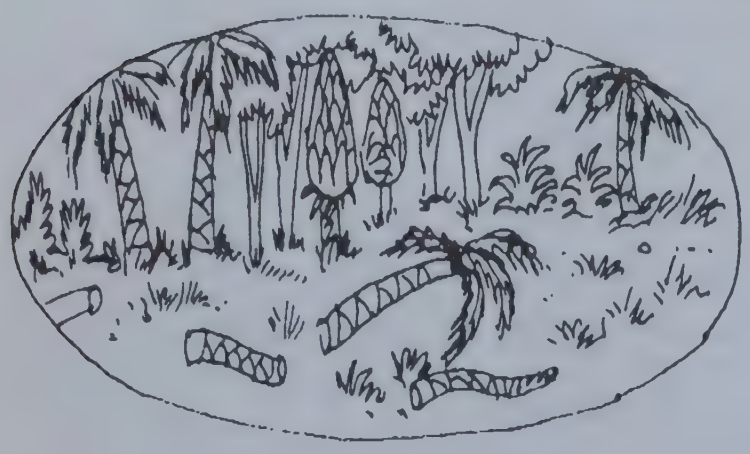
Cars, buses, lorries, motor cycles, ships and planes use petrol or diesel. Petrol and diesel are made from petroleum. Petroleum comes from oil wells under the ground or under the sea.

Steam engines and some power stations use coal as a fuel. In steam engines, burning coal heats water. The steam from the water turns the wheels of an engine. In *thermal power stations*, burning coal or oil is used to generate electricity. Coal comes from coal mines under the ground.

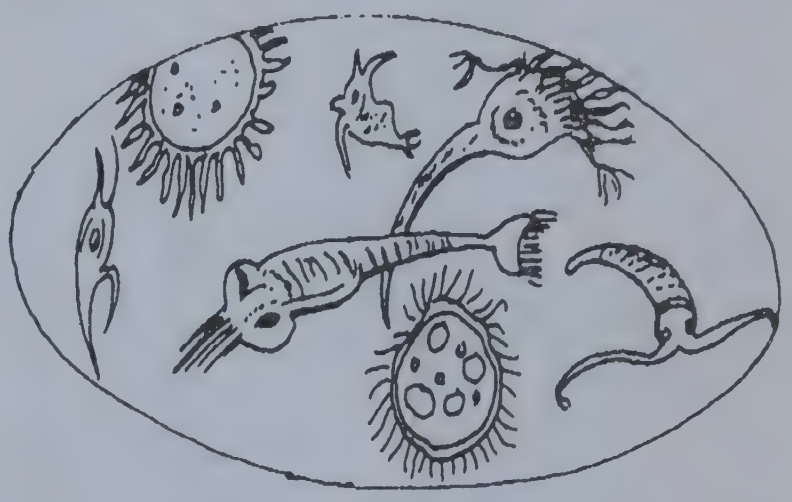
We also get cooking gas from underground. We can store it in gas containers and use it in our kitchens. Gas can also be used to generate electricity.

You have learnt how burning fossil fuels can pollute the atmosphere. Another problem with fossil fuels is that we are using them up fast. It took millions of years for oil and coal to form. It will take us only one or two hundred years to use them all up. So we must not waste them. We should also look for other kinds of energy.

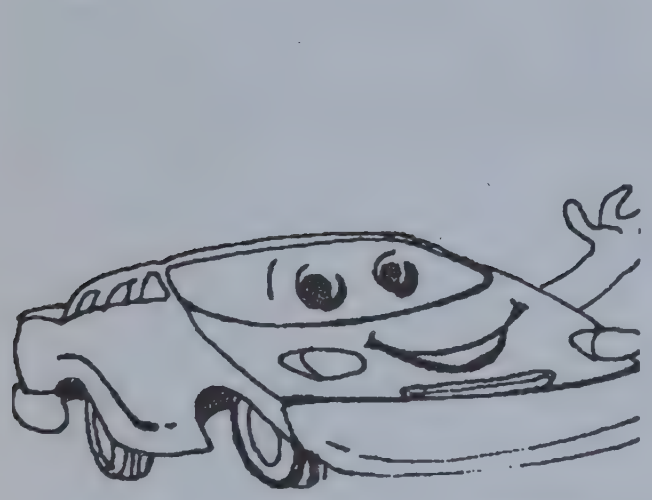
How fossil fuels were formed



coal forms from remains of plants which lived millions of years ago.



oil and gas forms from the remains of tiny plants and animals



Did you know?

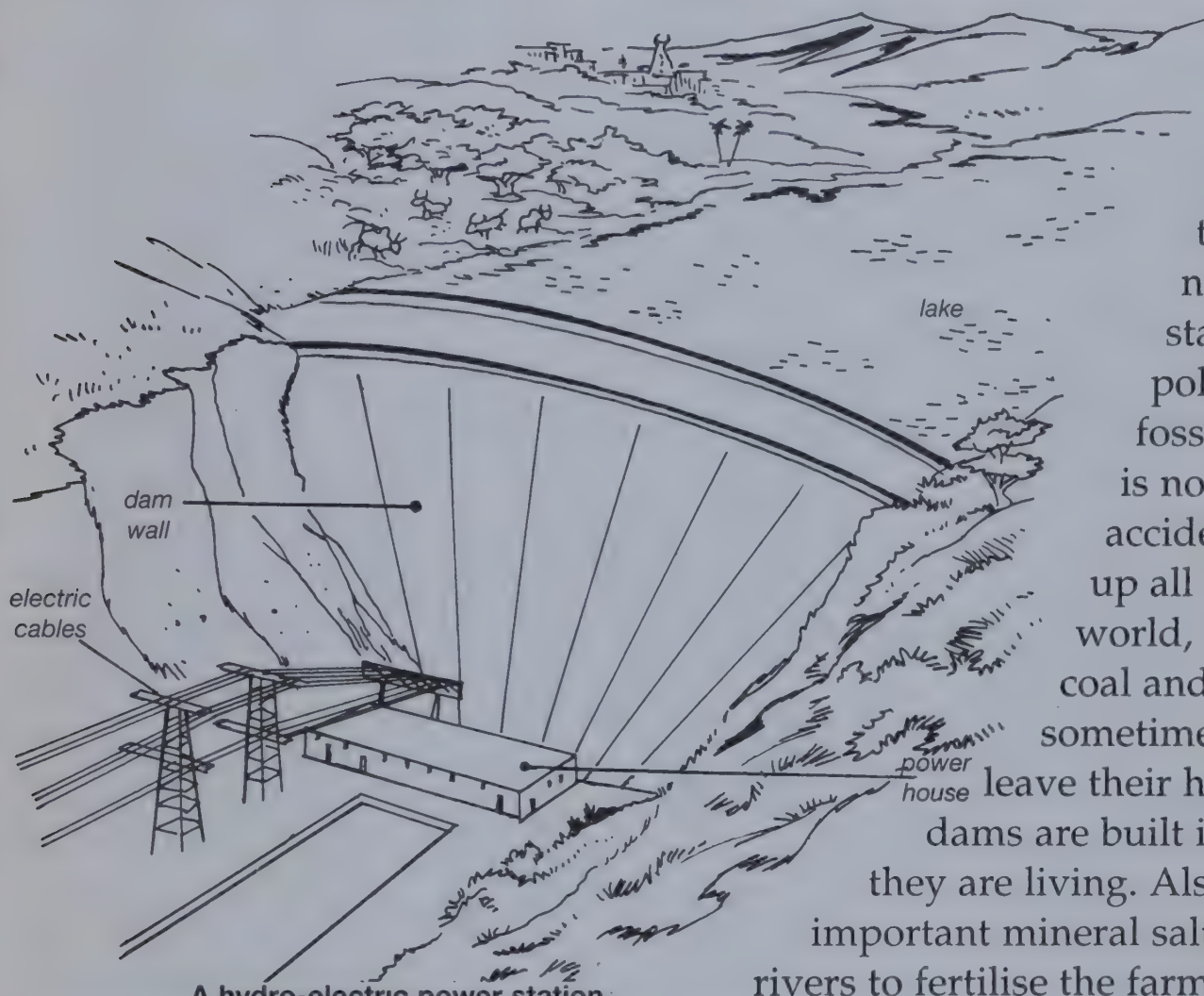
Some plants can be used to make fuel. In Brazil, many cars run on a fuel which is made from sugarcane.

NUCLEAR ENERGY

Many modern machines use electricity. Electricity is generated in power stations. We have already learnt that some power stations burn coal or gas. Electricity can also be generated in *nuclear power stations*. We know that nuclear power can be very dangerous if there is an accident. Another problem is that we do not know how to take the radiation out of the waste.

RENEWABLE ENERGY

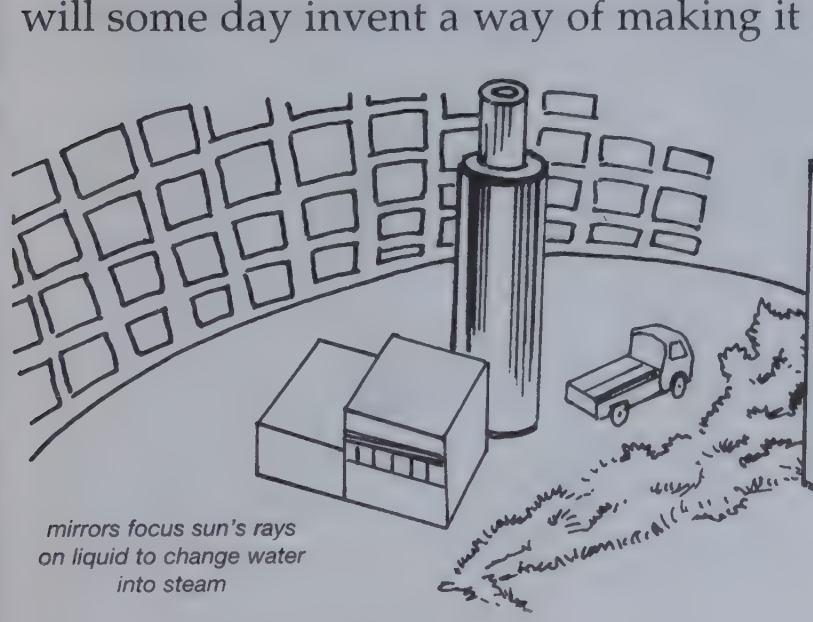
Renewable energy can be used again and again. It will never run out. Moving water is a kind of renewable energy. A lot of electricity is generated in *hydro-electric power stations*. Usually a dam is made across a valley. River water is trapped and makes a lake. Falling water from the lake generates electricity.



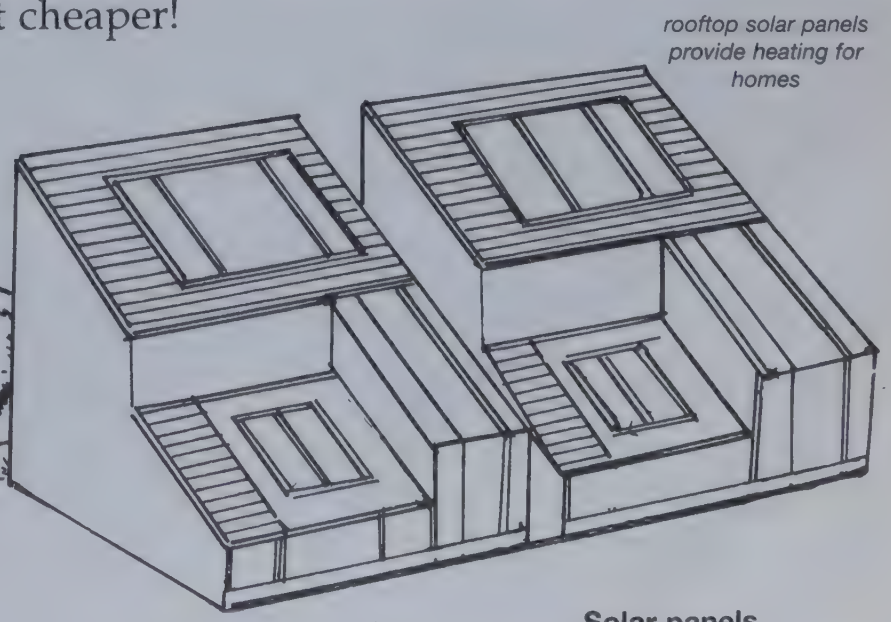
A hydro-electric power station

Small hydro-electric power stations are better for the environment than thermal or nuclear power stations. They do not pollute the air with fossil fuel smoke. There is no danger of a nuclear accident. We cannot use up all the water in the world, as we can use up oil, coal and gas. However, sometimes people have to leave their homes when big dams are built in the places where they are living. Also, the dams stop important mineral salts from going down rivers to fertilise the farmland below. These problems are not important if the hydro-electric power stations are kept small.

There are other kinds of renewable energy. Sunlight, the wind and the tides of the sea can all be used to generate electricity. They are clean and will not run out for millions of years. It is often expensive to generate electricity in these ways. Perhaps one of you will some day invent a way of making it cheaper!



A solar tower



Solar panels

In India, many farmers use animals to plough fields and pull carts. These animals do not need petrol or coal. But they help us to do work. Bullocks, horses and camels are all forms of renewable energy. As long as they have young ones, their energy will never run out!

Complete the following sentences.

1. Animals get their energy from	underground wells.
2. Fossil fuels are made of	generate electricity.
3. Three fossil fuels are	renewable kinds of energy.
4. Oil comes from	underground mines.
5. Coal comes from	food.
6. One day, we will use up all the	if there is an accident.
7. We can never use up	moving water.
8. Power stations	fossils of animals and plants.
9. Nuclear power can be dangerous	fossil fuels.
10. Hydro-electricity is generated by	sunlight, wind and tides.
11. Three renewable kinds of energy are	coal, gas and oil.

L. Conserving energy

All of us use fossil fuels. We use petrol or diesel every time we travel in a motor vehicle. Many of us use gas or kerosene in our stoves. If our electricity comes from a thermal power station, we are actually burning coal or gas every time we turn on an electric light. So we must try not to waste energy. We must conserve it. There are three good reasons for conserving energy:

1. Some day, we will finish up all the fossil fuels that are available on earth. We should try to make them last as long as possible.

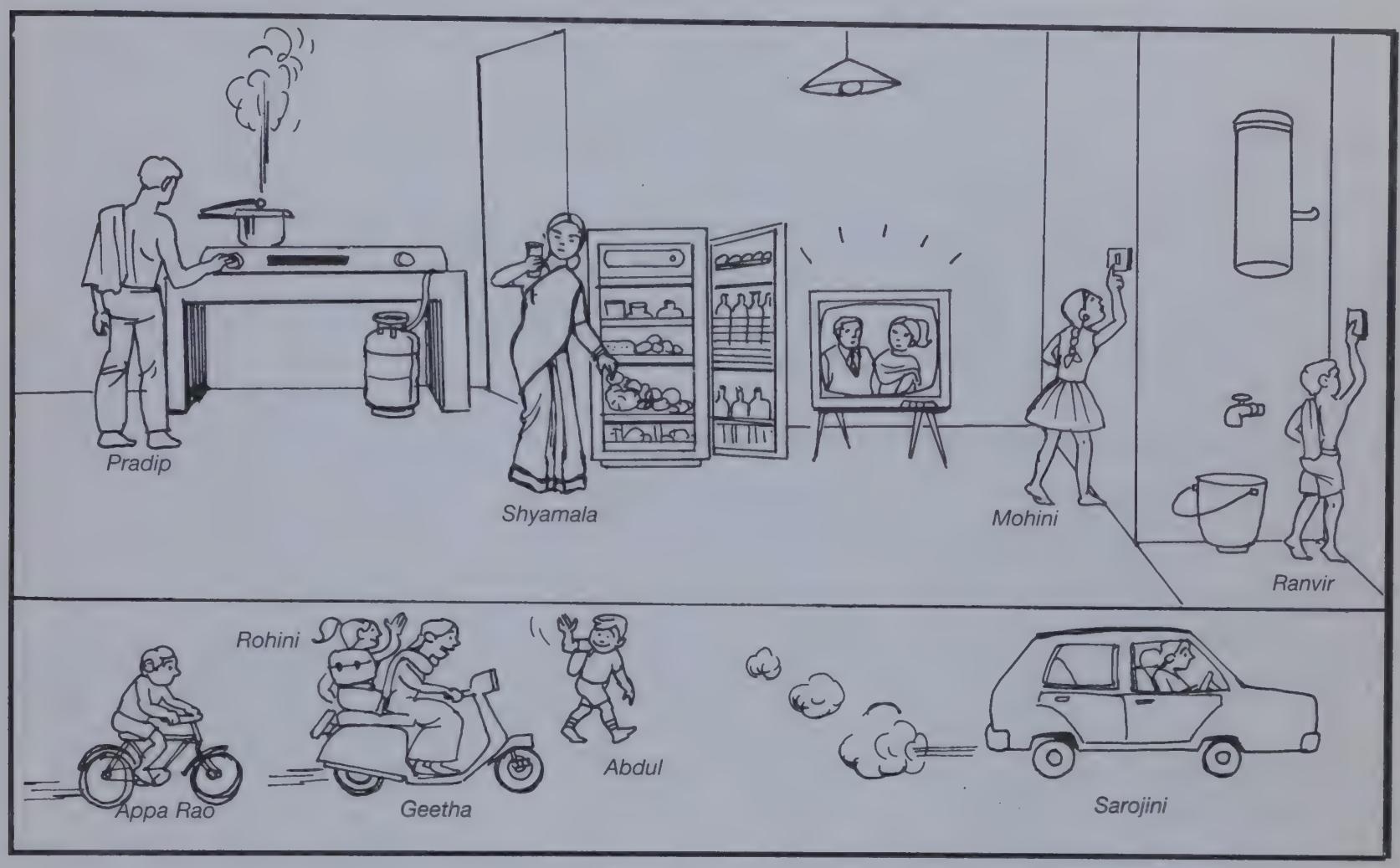
2. Fossil fuel smoke pollutes the air. It is making the earth warmer and causes acid rain.

3. We save money if we conserve energy.

There are different ways of conserving energy. Of course, we should remember to turn off lights and televisions etc., when we do not need them. We should try to walk as much as possible, not travel by motor cycle or cars. (The exercise is good for us too!) We should try to save fuel when we cook. For example, we save fuel if we cook in a

pressure cooker because it cooks food fast. If we live in places which get cold in winter, we should keep the heat in by shutting doors, windows and curtains.

When possible, we should use renewable energy. It is better to use gobar gas than coal or gas. As long as we keep cows and buffaloes, this will never run out!



Write a sentence about each person in the pictures above, following this pattern:

.....	*is* *is not*	*conserving energy, because .....*

You might have different answers. So long as you give a good reason, your teacher will mark your sentence right. For example, you might write,

Mohini is conserving energy because she has turned off the light.

Or you may write

Mohini is not conserving energy because she is not watching the television, but she has not turned it off.

Revision

I. Complete these sentences with words from the box.

Pulleys	Energy	Friction	Ball-bearings	Gravity	Forces	Levers

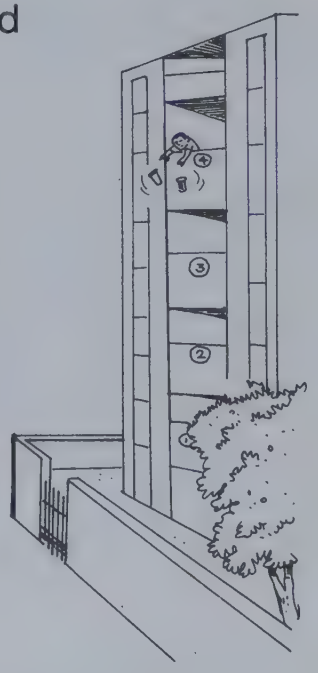
1. ..... is the power to do work.
2. ..... is a force which pulls things down to the earth.
3. ..... are pushes and pulls.
4. ..... is caused by rubbing two things together.
5. ..... can help us to open tight lids.
6. ..... can help us to lift heavy weights with a rope.
7. ..... help wheels to turn smoothly.

II. Match the following to their sources of energy.

1. a wood stove	gas from cow-dung
2. a solar powered stove	electricity
3. a stove with a gas cylinder	oil from underground
4. a biogas stove	trees
5. a kerosene stove	something which burns and is made of dead animals and plants which lived millions of years ago.
6. an electric stove	gas from underground
7. fossil fuel	the sun

III. Answer these questions:

1. Naughty Amir has pushed a paper cup and a metal tumbler off his balcony. Which do you think will land first?

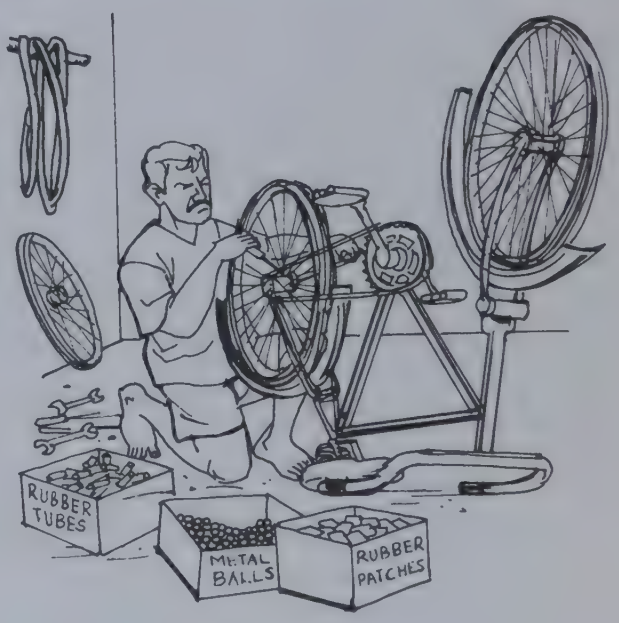


2. Kamaljit is going to run a race. She does not want her feet to slip on the ground. Should she choose the leather-soled shoes or the rubber-soled shoes? Why?

3. Which of these men has the easiest job? Why?

4. Why is Mrs Das putting oil into her sewing machine?

5. Vishvanath is mending a cycle. The wheel does not turn round smoothly. Does he need the rubber tubes, the little metal balls or the rubber patches?



Extension work

You will probably have to do this at home. Use any old scraps which your parents do not want. Also use your imagination! Ask a grown-up to help you if you need to hammer in nails or saw wood.

Design and make one of the following:

1. a pulley which can lift a weight of one kilogram, or
2. a weighing machine, or
3. a lamp which will flash when you press a button.

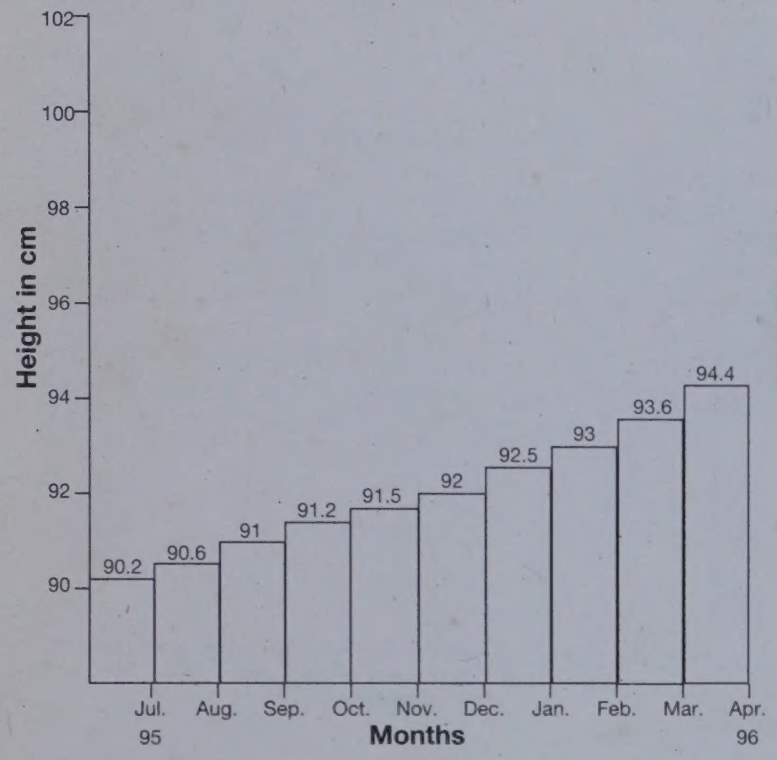
For the teacher :

Keep a record of the growth in height of your pupils. Pin a tape measure to a doors frame with 0 cm at floor level. Ask each child to get his/her height measured by a partner. Ask them to keep the record of this in the next page of this book. Get them to measure their heights every month and to make a graph of their growth. You may need to change the range or scale of the graph to suit the average height of your pupils.

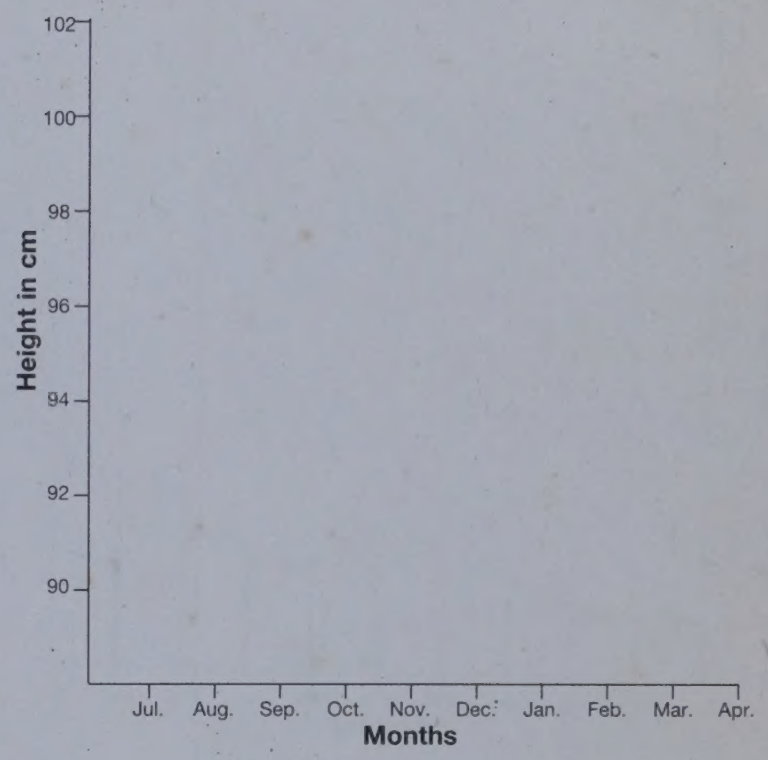
Height Graph

PERSONAL GROWTH GRAPH

Here is how Rita kept a record of her growth in height from July 95 to April 96.



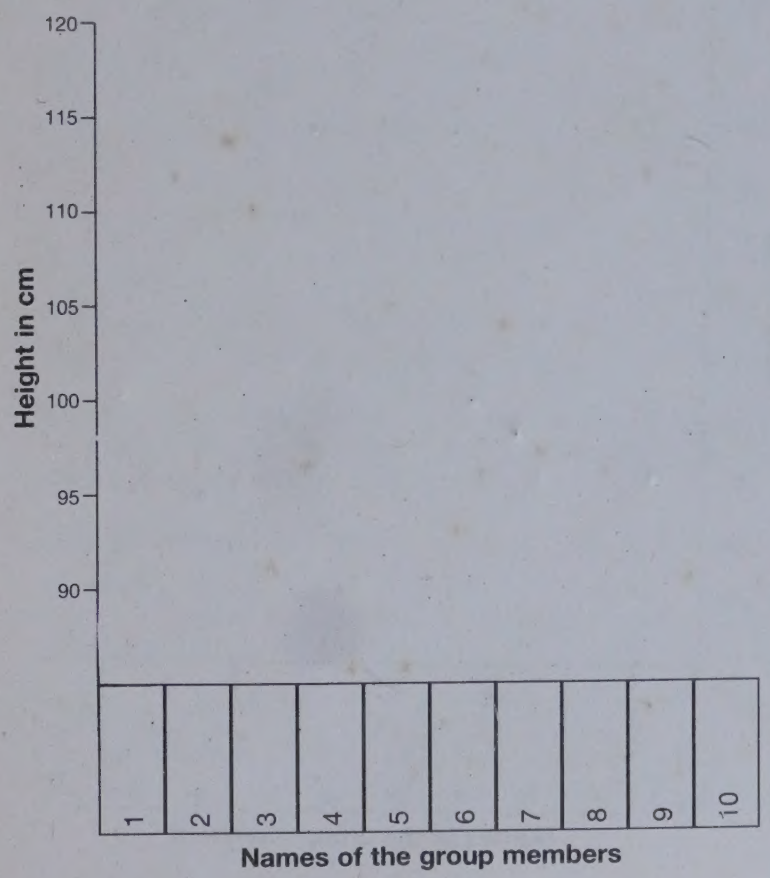
Record your growth in height in the same way in the graph below.



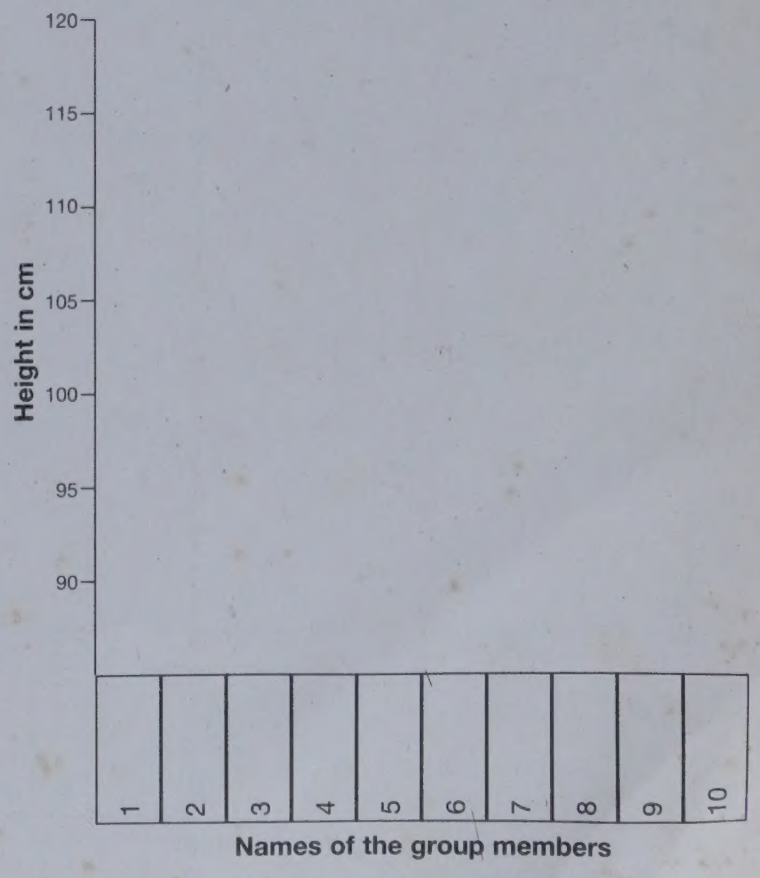
CLASS GROWTH GRAPH

Get into groups of ten. Record the growth in height of each member of your group.

Fill in this bar graph at the beginning of the school year.



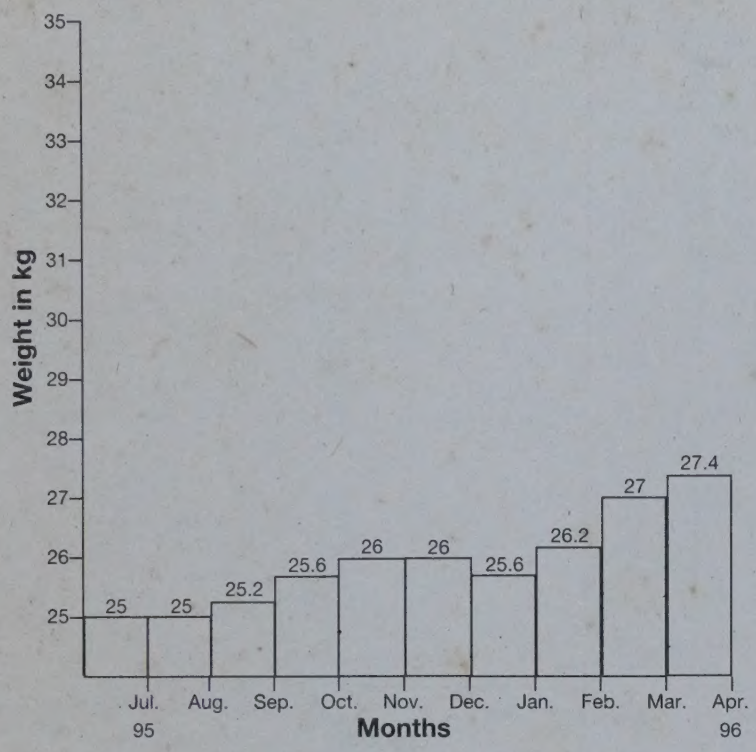
Fill in this bar graph towards the end of the school year.



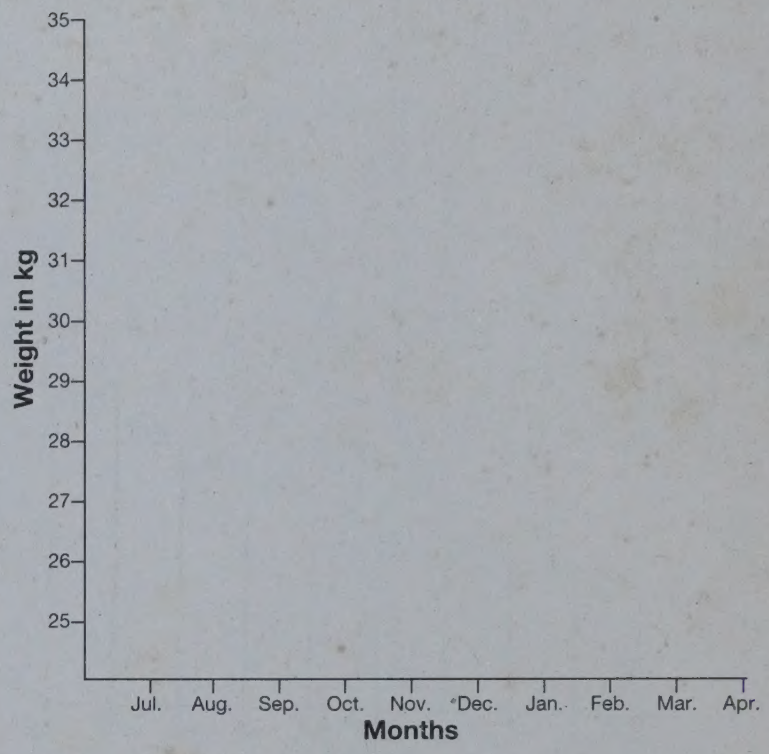
Weight Graph

PERSONAL GROWTH GRAPH

Here is how Ajit kept a record of her growth in weight from July 95 to April 96.



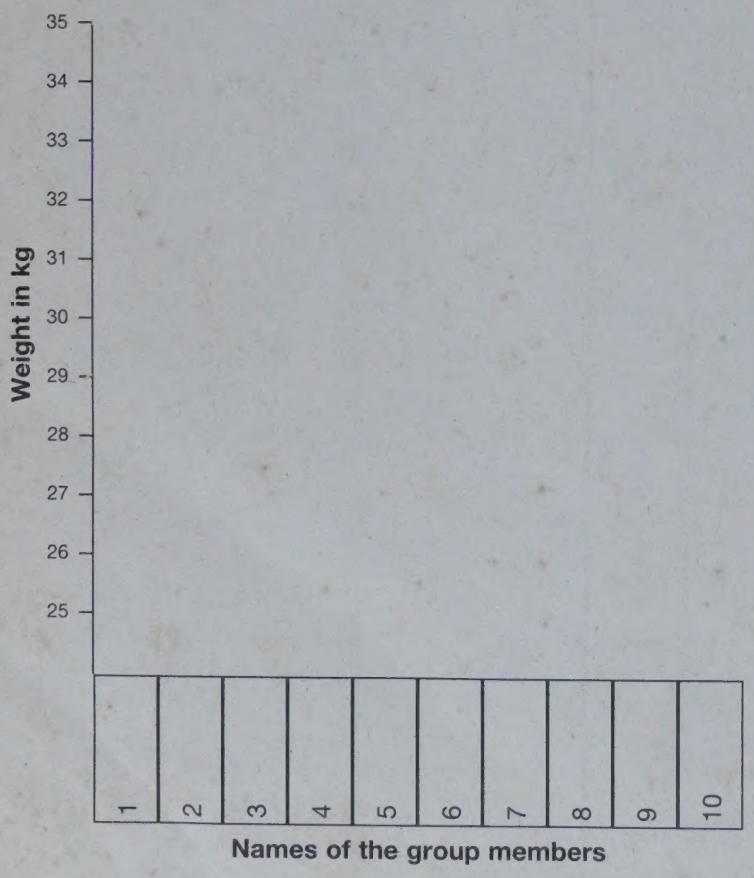
Record your growth in weight in the same way in the graph below.



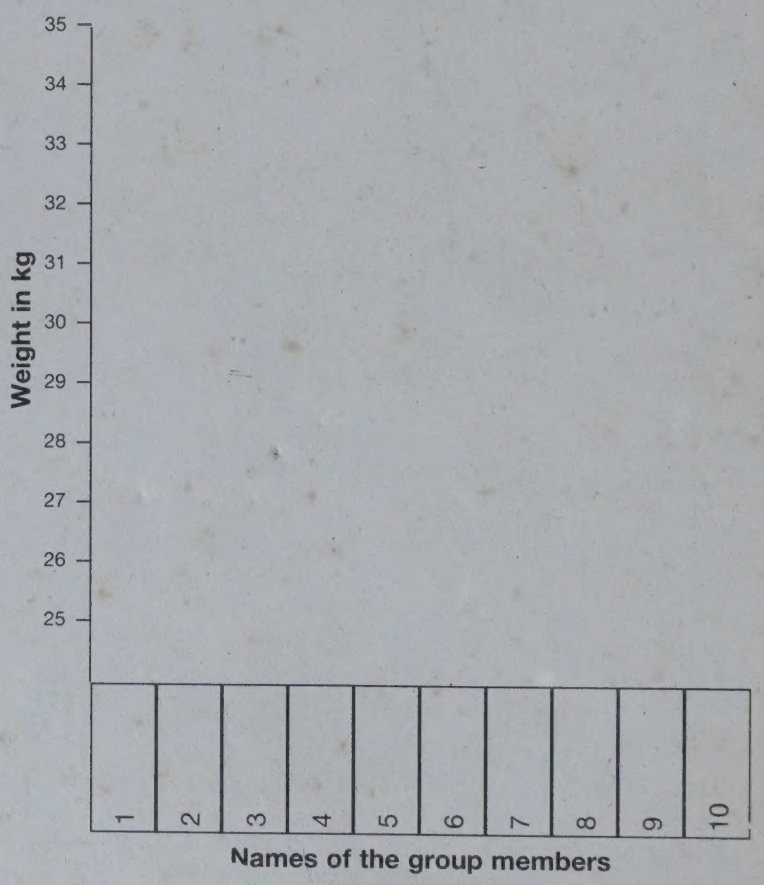
CLASS GROWTH GRAPH

Get into groups of ten. Record the growth in weight of each member of your group.

Fill in this bar graph at the beginning of the school year.



Fill in this bar graph towards the end of the school year.



The text

The text introduces your class to some basic scientific concepts. Read this to the children and discuss it as you read. Talk about the pictures and ideas in relation to the children's own experiences. The text should be a starting point for learning, not something to be memorised. One of the reasons why children memorise their textbooks is that the language is too difficult for them to understand. We hope that you will find the English in these books simple and easily accessible to children.

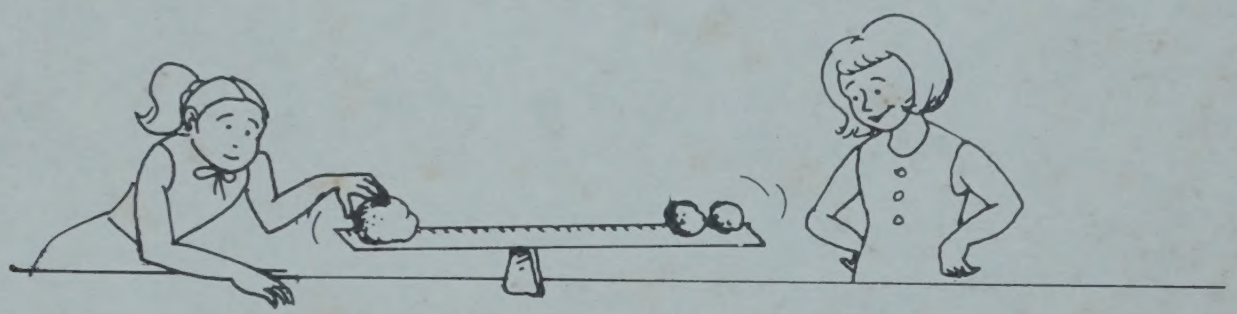
Encourage your pupils to come up with their own ideas about the subject. Discuss them seriously even if these ideas seem scientifically incorrect. Remember that even the greatest scientists understand very little about the universe. Ideas which we now accept as facts may one day be proved wrong !

Practical work

Please try not to avoid practical work. It may not always be easy but the children will learn much more from it ! How children learn science is as important as what they learn. Primary school children learn best by doing, not by memorising.

Practical work may involve a simple experiment or guided observation. Scientists learn by making hypotheses, testing them and then thinking about their results. Encourage the children to guess what will happen before an experiment and to explain their results afterwards, even if the results are unexpected. Don't be angry if an experiment goes 'wrong'. Children can learn a great deal from it. Ask them to think why it happened that way and how they might change the experiment.

Whenever possible, allow the children to do the experiments for themselves. Simple experiments can be done in pairs. If the equipment is expensive or difficult to obtain, they can work in groups of up to eight. They will learn more from doing an experiment than from watching you do it.



Don't do all the experiments yourself—let the children have a go !

As your pupils get used to doing experiments, help them to see the importance of doing a fair test. For example, if they are finding out whether green gram grows better in the sun or in the shade, the other variables should be constant. If you put one plant in the sun and one in the shade, both plants should be grown in the same type of soil and be given the same amount of water.

Allow time for the children to design their own experiments. You don't need to follow this book word for word. Only the teacher can encourage independent ideas which are essential to truly scientific thought.

Written work

You may set written work in class or for homework. If you don't wish the children to do any writing, do the exercises orally but never dictate correct answers. Let the children work them out for themselves and then correct what they have written.

Most of the exercises in the book are designed for children who may not be able to express their own ideas in English. A sentence structure is often given so that they can write what they found out in simple language. If their English is very good, encourage them to write up experiments in their own words instead of doing the exercises.

Revision exercises

The first three questions can be used to assess how much each child has learned from a unit. They can also be used later in examinations. Question IV (Extension work) is usually more open-ended than the others. If some children find it hard, give it only to your more able pupils. It is not designed to test the children, but to develop their ability to think for themselves.

In conclusion

Every attempt has been made to make this series clear, interesting and easy to use. All activities have been tried out by the author in primary schools over the years and the integrated approach of topic work has been found both enjoyable and effective. It is hoped that you and your pupils will find it enjoyable too.

Open Sesame is a series of activity-based science books for Classes 3, 4 and 5. The emphasis is on understanding concepts and scientific thinking in preference to rote learning. To give time for practical work, the load of facts is kept to a minimum. The language used is deliberately simple and clearly structured for children learning through English as a second language. The materials needed are easily obtainable in an ordinary house and are clearly listed before each experiment. This is a book which leads children to experience science.

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Orient Longman

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